

UNITED STATES NUCLEAR REGULATORY COMMISSION
RULES and REGULATIONS

TITLE 10, CHAPTER 1, CODE OF FEDERAL REGULATIONS—ENERGY

PART
110

**EXPORT AND IMPORT OF NUCLEAR EQUIPMENT
AND MATERIAL**

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Authority: Secs. 51, 53, 54, 57, 63, 64, 65, 81, 82, 103, 104, 109, 111, 126, 127, 128, 129, 161, 181, 182, 183, 187, 189, 68 Stat. 929, 930, 931, 932, 933, 936, 937, 948, 953, 954, 955, 956, as amended (42 U.S.C. 2071, 2073, 2074, 2077, 2092–2095, 2111, 2112, 2133, 2134, 2139, 2139a, 2141, 2154–2158, 2201, 2231–2233, 2237, 2239); sec. 201, 88 Stat. 1242, as amended (42 U.S.C. 5841); sec. 5, Pub. L. 101–575, 104 Stat. 2835 (42 U.S.C. 2243).

Sections 110.1(b)(2) and 110.1(b)(3) also issued under Pub. L. 96–92, 93 Stat. 710 (22 U.S.C. 2403). Section 110.11 also issued under sec. 122, 68 Stat. 939 (42 U.S.C. 2152) and secs. 54c and 57d, 88 Stat. 473, 475 (42 U.S.C. 2074). Section 110.27 also issued under sec. 309(a), Pub. L. 99–440. Section 110.50(b)(3) also issued under sec. 123, 92 Stat. 142 (42 U.S.C. 2153). Section 110.51 also issued under sec. 184, 68 Stat. 954, as amended (42 U.S.C. 2234). Section 110.52 also issued under sec. 186, 68 Stat. 955 (42 U.S.C. 2236). Sections 110.80–110.113 also issued under 5 U.S.C. 552, 554. Sections 110.130–110.135 also issued under 5 U.S.C. 553. Sections 110.2 and 110.42(a)(9) also issued under sec. 903, Pub. L. 102–496 (42 U.S.C. 2151 et seq.).

Subpart A — General Provisions

§ 110.1 Purpose and scope.

(a) The regulations in this part prescribe licensing, enforcement, and rulemaking procedures and criteria, under the Atomic Energy Act, for the export of nuclear equipment and material, as set out in § 110.8 and § 110.9, and the import of nuclear equipment and material, as set out in § 110.9a. This part also gives notice to all persons who knowingly provide to any licensee, contractor, or subcontractor, components, equipment, materials, or other goods or services, that relate to a licensee's activities subject to this part, that they may be individually subject to NRC enforcement action for violation of § 110.7b.

(b) The regulations in this part apply to all persons in the United States except:

(1) The Departments of Defense and Energy for activities authorized by sections 54, 64, 82, and 91 of the Atomic Energy Act, except when the Department of Energy seeks an export license under section 111 of the Atomic Energy Act;

➤ (2) Persons who export or import U.S. Munitions List nuclear items, such as uranium depleted in the isotope-235 and incorporated in defense articles. These persons are subject to the controls of the Department of State pursuant to 22 CFR 120–130 "International Traffic in Arms Regulations" (ITAR), under the Arms Export Control Act, as authorized by section 110 of the International Security and Development Cooperation Act of 1980;

(3) Persons who export uranium depleted in the isotope-235 and incorporated in commodities solely to take advantage of high density or pyrophoric characteristics. These persons are subject to the controls of the Department of Commerce under the Export Administration Act, as authorized by section 110 of the International Security and Development Cooperation Act of 1980;

(4) Persons who export nuclear referral list commodities. These persons are subject to the licensing authority of the Department of Commerce pursuant to 15 CFR part 799, such as bulk zirconium, rotor and bellows equipment, maraging steel, nuclear reactor related equipment, including process control systems and simulators; and

(5) Persons who import deuterium, nuclear grade graphite, or nuclear equipment other than production or utilization facilities. A uranium enrichment facility is not a production facility.

§ 110.2 Definitions.

As used in this part, "Agreement for cooperation" means any agreement with another nation or group of nations concluded under section 123 of the Atomic Energy Act, as amended.

"Atomic Energy Act" means the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011).

"Byproduct material" means radioactive material (except special nuclear material) produced by exposure to the radiation incident to the process of producing or using special nuclear material.

"Classified information" means National Security Information classified under Executive Order 12356.

"Commission" means the United States Nuclear Regulatory Commission or its duly authorized representatives.

"Common defense and security" means the common defense and security of the United States.

➤ *Conversion facility* means any facility for the transformation from one uranium chemical species to another, including: conversion of uranium ore concentrates to UO₃, conversion of UO₃ to UO₂, conversion of uranium oxides to UF₄ or UF₆, conversion of UF₄ to UF₆, conversion of UF₆ to UF₄, conversion of UF₄ to uranium metal, and conversion of uranium fluorides to UO₂.

59 FR 48994

59 FR 12999

49 FR 47191

58 FR 12999

61 FR 35600

61 FR 35600

49 FR 47191

61 FR 35600

49 FR 47191
 "Deuterium" means deuterium and any deuterium compound, including heavy water, in which the ratio of deuterium atoms to hydrogen atoms exceeds 1:5000.

60 FR 37556
Disposal means permanent isolation of radioactive material from the surrounding environment.

49 FR 47191
 "Effective kilograms of special nuclear material" means:

- (1) For plutonium and uranium-233, their weight in kilograms;
- (2) For uranium enriched 1 percent or greater in the isotope U-235, its element weight in kilograms multiplied by the square of its enrichment expressed as a decimal weight fraction; and
- (3) For uranium enriched below 1 percent in the isotope U-235, its element weight in kilograms multiplied by 0.0001.

"Executive Branch" means the Departments of State, Energy, Defense and Commerce and the Arms Control and Disarmament Agency.

58 FR 12999
Export means to physically transfer nuclear equipment or material to a person or an international organization in a foreign country, except DOE distributions as authorized in Section 111 of the Atomic Energy Act or Section 110 of the International Security and Development Cooperation Act of 1980.

49 FR 47191
 "General license" means an export or import license effective without the filing of a specific application with the Commission or the issuance of licensing documents to a particular person.

"High-enriched uranium" means uranium enriched to 20 percent or greater in the isotope uranium-235.

"IAEA" means the International Atomic Energy Agency.

"Import" means import into the United States.

60 FR 37556
Incidental radioactive material means any radioactive material not otherwise subject to specific licensing under this part that is contained in or a contaminant of any non-radioactive material that:

- (1) For purposes unrelated to the regulations in this part, is exported or imported for recycling or resource recovery of the non-radioactive component; and
- (2) Will not be processed for separation of the radioactive component before the recycling or resource recovery occurs or as part of the resource recovery process.

The term does not include material that contains or is contaminated with "hazardous waste" as defined in section 1004(5) of the Solid Waste Disposal Act, 42 U.S.C. 6903(5).

58 FR 12999
Individual shipment means a shipment consisting of one lot of freight tendered to a carrier by one consignor at one place at one time for delivery to one consignee on one bill of lading. This lot may consist of:

- (1) Only one item or
- (2) A number of containers all listed on the same set of shipping documents. This one lot of freight or "distinct" shipment can be transported on the same carrier with other distinct shipments containing the same items as long as each shipment is covered by separate sets of shipping documents.

49 FR 47191
 The phrase "introduced into a hearing" means the introduction or incorporation of testimony or documentary matter into the record of a hearing.

"License" means a general or specific export or import license issued pursuant to this part.

"Licensee" means a person authorized by a specific or a general license to export or import nuclear equipment or material pursuant to this part.

"Low-enriched uranium" means uranium enriched below 20 percent in the isotope uranium-235.

60 FR 37556
Management means storage, packaging, or treatment of radioactive waste.

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49 FR 47191

"NPT" means the Treaty on the Non-Proliferation of Nuclear Weapons (TIAS 6839).

"Non-nuclear weapon State" means any State not a nuclear weapon State as defined in the Treaty on the Non-Proliferation of Nuclear Weapons. "Nuclear weapon State" means any State which has manufactured and exploded a nuclear weapon or other nuclear explosive device prior to January 1, 1987.

"Non-Proliferation Act" means the Nuclear Non-Proliferation Act of 1978 (Pub. L. 95-242).

"NRC records" means any documentary material made by, in the possession of, or under the control of the Commission under Federal law or in connection with the transaction of public business as evidence of any of the Commission's activities.

"Nuclear grade graphite" means graphite with a boron equivalent content of less than 5 parts per million and density greater than 1.5 grams per cubic centimeter.

"Nuclear reactor" means an apparatus, other than an atomic weapon or nuclear explosive device, designed or used to sustain nuclear fission in a self-supporting chain reaction.

58 FR 12999

Nuclear Referral List (NRL) means the nuclear-related, dual-use commodities on the Commerce Control List that are subject to the nuclear non-proliferation export licensing controls of the Department of Commerce. They are contained in Supplement No. 1 to 15 CFR part 799 of the Department of Commerce's Export Administration Regulations and are designated by the symbol (NP) as the reason for control.

49 FR 47191

"Packaging" means one or more receptacles and wrappers and their contents, excluding any special nuclear material, source material or byproduct material, but including absorbent material, spacing structures, thermal insulation, radiation shielding, devices for cooling and for absorbing mechanical shock, external fittings, neutron moderators, nonfissile neutron absorbers and other supplementary equipment.

"Participant" means a person, identified in a hearing notice or other Commission order, who takes part in a hearing conducted by the Commission under this part, including any person to whom the Commission grants a hearing or leave to intervene in an export or import licensing hearing, either as a matter of right or as a matter of discretion.

49 FR 49841

"Person" means any individual, corporation, partnership, firm, association, trust, estate, institution, group, Government agency other than the Commission or, with respect to imports, the Department of Energy; any State or political entity within a State; any foreign government or political entity of such government; and any authorized representative of the foregoing.

49 FR 47191

"Physical security" means measures to reasonably ensure that source or special nuclear material will only be used for authorized purposes and to prevent theft or sabotage.

58 FR 12999

Production facility means any nuclear reactor or plant specially designed or used to produce special nuclear material through the irradiation of source material or special nuclear material, the chemical reprocessing of irradiated source or special nuclear material, or the separation of isotopes, other than a uranium enrichment facility.

53 FR 43419

"Public Document Room" means the place at 2120 L Street NW., Washington, D.C., where public records of the Commission are ordinarily available for inspection.

49 FR 47191

"Public health and safety" means the public health and safety of the United States.

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<div>60 FR 37556</div> <div><p><i>Radioactive material</i> means source, byproduct, or special nuclear material.</p><p><i>Radioactive waste</i> means any waste that contains or is contaminated with source, byproduct, or special nuclear material, including any such waste that contains or is contaminated with "hazardous waste" as defined in section 1004(5) of the Solid Waste Disposal Act, 42 U.S.C. 6903(5), but such term does not include radioactive material that is—</p><p>(1) Contained in a sealed source, or device containing a sealed source, that is being returned to any manufacturer qualified to receive and possess the sealed source or the device containing a sealed source;</p><p>(2) A contaminant on service equipment (including service tools) used in nuclear facilities, if the service equipment is being shipped for use in another nuclear facility and not for waste management purposes or disposal; or</p><p>(3) Generated or used in a United States Government waste research and development testing program under international arrangements.</p></div>	<div>59 FR 48994</div> <div><p><i>Specific activity</i> (millicuries per gram) equals 3.575×10^8 divided by (the atomic weight times the half life in years).</p></div>	<div>60 FR 37556</div> <div><p><i>Treatment</i> means any method, technique, or process, including storage for radioactive decay, designed to change the physical, chemical or biological characteristics or composition of any radioactive material.</p></div>
<div>49 FR 47191</div> <div><p>"Specific license" means an export or import license issued to a named person upon an application filed pursuant to this part.</p></div>	<div>51 FR 27825</div> <div><p>"Tritium" means not only tritium but also includes compounds and mixtures containing tritium in which the ratio of tritium to hydrogen by atoms exceeds one part in 1,000.</p></div>	
<div>60 FR 37556</div> <div><p><i>Storage</i> means the temporary holding of radioactive material.</p></div>	<div>49 FR 47191</div> <div><p>"United States", when used in a geographical sense, includes Puerto Rico and all territories and possessions of the United States.</p></div>	
<div>58 FR 57962</div> <div><p><i>Target</i> means material subjected to irradiation in an accelerator or nuclear reactor to induce a reaction or produce nuclear material.</p></div>	<div>57 FR 18388</div> <div><p><i>Uranium enrichment facility</i> means:</p><p>(1) Any facility used for separating the isotopes of uranium or enriching uranium in the isotope 235, except laboratory scale facilities designed or used for experimental or analytical purposes only; or</p><p>(2) Any equipment or device, or important component part especially designed for such equipment or device, capable of separating the isotopes of uranium or enriching uranium in the isotope 235.</p></div>	
<div>49 FR 47191</div> <div><p>"Retransfer" means the transport from one foreign country to another of nuclear equipment or nuclear material previously exported from the United States, or of special nuclear material produced through the use of source material or special nuclear material previously exported from the United States.</p><p>"Sealed source" means any special nuclear material or byproduct material encased in a capsule designed to prevent leakage or escape of that nuclear material.</p><p>"Secretary" means the Secretary of the Commission.</p><p>"Source material" means:</p><p>(1) Uranium or thorium, other than special nuclear material; or</p><p>(2) Ores which contain by weight 0.05 percent or more of uranium or thorium, or any combination of these.</p><p>"Special nuclear material" means plutonium, uranium-233 or uranium enriched above 0.711 percent by weight in the isotope uranium-235.</p></div>	<div>49 FR 47191</div> <div><p>"Transfer" means the transfer of possession from one person to another person.</p><p>"Transport" means the physical movement of material from one location to another.</p></div>	

58 FR 12999

Utilization facility means:

- (1) Any nuclear reactor, other than one that is a production facility and
- (2) Any of the following major components of a nuclear reactor:
 - (i) Reactor pressure vessel (designed to contain the core of a nuclear reactor);
 - (ii) Reactor primary coolant pump;
 - (iii) "On-line" reactor fuel charging and discharging machine; and
 - (iv) Complete reactor control rod system.
- (3) A utilization facility does not include the steam turbine generator portion of a nuclear power plant.

43 FR 21641

§ 110.3 Interpretations.

Except as authorized by the Commission in writing, no interpretation of the meaning of the regulations in this part other than a written interpretation by the Commission's General Counsel is binding upon the Commission.

59 FR 48994

§ 110.4 Communications.

Except where otherwise specified in this part, all communications and reports concerning the regulations in this part should be addressed to the Director for Nonproliferation, Exports, and Multilateral Relations, Office of International Programs, U.S. Nuclear Regulatory Commission, Washington, DC 20555, telephone (301) 464-2344. Communications and reports may be delivered in person at the Commission's offices at 11555 Rockville Pike, Rockville, Maryland 20852 or at 2120 L Street NW. (Lower Level), Washington, DC 20037.

58 FR 12999

§ 110.5 Licensing requirements.

Except as provided under subpart B of this part, no person may export any nuclear equipment or material listed in § 110.8 and § 110.9, or import any nuclear equipment or material listed in § 110.9a, unless authorized by a general or specific license issued under this part.

55 FR 34518

§ 110.6 Retransfers.

(a) Retransfer of any nuclear equipment or material listed in § 110.8 and § 110.9, including special nuclear material produced through the use of U.S.-origin source material or special nuclear material, requires authorization by the Department of Energy, unless the export to the new destination is authorized under a special or general license or an exemption from licensing requirements. Under certain agreements for cooperation, Department of Energy authorization also is required for the retransfer of special nuclear material produced through the use of non-U.S.-supplied nuclear material in U.S.-supplied utilization facilities.

58 FR 12999

(b) Requests for authority to retransfer are processed by the Department of Energy, Office of Arms Control and Nonproliferation Technology Support, Washington, D.C. 20585.

59 FR 48994

§ 110.7 Information collection requirements: OMB approval.

The Nuclear Regulatory Commission has submitted the information collection requirements contained in this part to the Office of Management and Budget (OMB) for approval as required by the Paperwork Reduction Act of 1980 (44 U.S.C. 3501 et. seq.). OMB has approved the information collection requirements in §§ 110.20, 110.26, 110.31, 110.32, 110.50 and 110.53 under control number 3150-0036, and has approved the use of Form NRC-7, as referenced in § 110.31, under control number 3150-0027. No other information collection requirements are contained in Part 110.

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§ 110.7a Completeness and accuracy of information.

(a) Information provided to the Commission by an applicant for a license or by a licensee or information required by statute or by the Commission's regulations, orders, or license conditions to be maintained by the applicant or the licensee shall be complete and accurate in all material respects.

(b) Each applicant or licensee shall notify the Commission of information identified by the applicant or licensee as having for the regulated activity a significant implication for public health and safety or common defense and security. An applicant or licensee violates this paragraph only if the applicant or licensee fails to notify the Commission of information that the applicant or licensee has identified as having a significant implication for public health and safety or common defense and security. Notification shall be provided to the Administrator of the appropriate Regional Office within two working days of identifying the information. This requirement is not applicable to information which is already required to be provided to the Commission by other reporting or updating requirements.

§ 110.7b Deliberate misconduct.

(a) Any licensee or any employee of a licensee; and any contractor (including a supplier or consultant), subcontractor, or any employee of a contractor or subcontractor, of any licensee, who knowingly provides to any licensee, contractor, or subcontractor, components, equipment, materials, or other goods or services, that relate to a licensee's activities subject to this part; may not:

(1) Engage in deliberate misconduct that causes or, but for detection, would have caused, a licensee to be in violation of any rule, regulation, or order, or any term, condition, or limitation of any license, issued by the Commission, or

(2) Deliberately submit to the NRC, a licensee, or a licensee's contractor or subcontractor, information that the person submitting the information knows to be incomplete or inaccurate in some respect material to the NRC.

(b) A person who violates paragraph (a)(1) or (a)(2) of this section may be subject to enforcement action in accordance with the procedures in 10 CFR part 2, subpart B.

(c) For purposes of paragraph (a)(1) of this section, deliberate misconduct by a person means an intentional act or omission that the person knows:

(1) Would cause a licensee to be in violation of any rule, regulation, or order, or any term, condition, or limitation, of any license issued by the Commission, or

(2) Constitutes a violation of a requirement, procedure, instruction, contract, purchase order or policy of a licensee, contractor, or subcontractor.

separation of isotopes of uranium. (See appendices to this part for lists of: gas centrifuge equipment—Appendix B; gaseous diffusion equipment—Appendix C; aerodynamic enrichment equipment—Appendix D; chemical exchange or ion exchange enrichment equipment—Appendix E; laser based enrichment equipment—Appendix F; plasma separation enrichment equipment—Appendix G; and electromagnetic enrichment equipment—Appendix H.)

(c) Plants for the separation of the isotopes of lithium and especially designed or prepared assemblies and components for these plants.

(d) Plants for the reprocessing of irradiated nuclear reactor fuel elements and especially designed or prepared assemblies and components for these plants. (See Appendix I to this part.)

(e) Plants for the fabrication of nuclear reactor fuel elements and especially designed or prepared assemblies and components for these plants.

(f) Plants for the conversion of uranium and especially designed or prepared assemblies and components for these plants. (See Appendix J to this part.)

(g) Plants for the production, separation, or purification of heavy water, deuterium, and deuterium compounds and especially designed or prepared assemblies and components for these plants. (See Appendix K to this part.)

(h) Other nuclear-related commodities are under the export licensing authority of the Department of Commerce.

§ 110.8 List of nuclear facilities and equipment under NRC export licensing authority.

➤ (a) Nuclear reactors and especially designed or prepared equipment and components for nuclear reactors. (See appendix A to this part.)

(b) Plants for the separation of isotopes of uranium (source material or special nuclear material) including gas centrifuge plants, gaseous diffusion plants, aerodynamic enrichment plants, chemical exchange or ion exchange enrichment plants, laser based enrichment plants, plasma separation enrichment plants, electromagnetic enrichment plants, and especially designed or prepared equipment, other than analytical instruments, for the

§ 110.9 List of Nuclear Material under NRC export licensing authority.

- (a) Special Nuclear Material.
- (b) Source Material.
- (c) Byproduct Material.
- (d) Deuterium.
- (e) Nuclear grade graphite.

§ 110.9a List of nuclear equipment and material under NRC import licensing authority.

- (a) Production and utilization facilities.
- (b) Special nuclear material.
- (c) Source material.
- (d) Byproduct material.

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Subpart B — Exemptions

§ 110.10 General.

(a) In response to a request or on its own initiative, the Commission may grant an exemption from the regulations in this part, if it determines that the exemption—

- (1) Is authorized by law;
- (2) Is not inimical to the common defense and security; and
- (3) Does not constitute an unreasonable risk to the public health and safety.

(b) An exemption from statutory licensing requirements, as authorized by sections 57d, 62, and 81 of the Atomic Energy Act, will be granted only after coordination with the Executive Branch and after completion of rulemaking proceedings under Subpart K of this part.

(c) The granting of an exemption does not relieve any person from complying with the regulations of other Government agencies applicable to exports or imports under their authority.

§ 110.11 Export of IAEA safeguards samples.

A person is exempt from the requirements for a license to export special nuclear material set forth in sections 53 and 54d. of the Atomic Energy Act and from the regulations in this part to the extent that the person exports special nuclear material in IAEA safeguards samples, if the samples are exported in accordance with § 75.42(e)(1) of this chapter, or a comparable Department of Energy order, and are in quantities not exceeding a combined total of 100 grams of contained plutonium, U-233 and U-235 per facility per year. This exemption does not relieve any person from complying with Parts 71 or 73 of this chapter or any Commission order pursuant to section 201(a) of the Energy Reorganization Act of 1974 (42 U.S.C. 5841(a)).

Subpart C — Licenses

§ 110.19 Types of licenses.

(a) Licenses for the export and import of nuclear equipment and material in this part consist of two types: General licenses and Specific licenses. Except as provided in paragraph (b) of this section, a general license is effective without the filing of an application with the Commission or the issuance of licensing documents to a particular person. A specific license is issued to a named person and is effective upon approval by the Commission of an application filed pursuant to the regulations in this part and issuance of licensing documents to the applicant. Issuance of a specific or general license under this part does not relieve a person from complying with applicable regulations of the Environmental Protection Agency for any export or import that contains or is contaminated with hazardous waste.

(b) A person using a general license under this part as authority to export incidental radioactive material that is contained in or a contaminant of a shipment that exceeds 100 kilograms in total weight shall file a completed NRC Form 7 before the export takes place.

§ 110.20 General license information.

(a) A person may use an NRC general license as authority to export or import nuclear equipment or material (including incidental radioactive material), if the nuclear equipment or material to be exported or imported is covered by the NRC general licenses described in §§ 110.21 through 110.30.

(1) A person using a general license under this part as authority to export incidental radioactive material that is contained in or a contaminant of a shipment that exceeds 100 kilograms in total weight shall file a completed NRC Form 7 before the export takes place.

(2) If an export or import is not covered by the NRC general licenses described in §§ 110.21 through 110.30, a person must file an application with the Commission for a specific license in accordance with §§ 110.31 through 110.32.

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(b) In response to a petition or on its own initiative, the Commission may issue a general license for export or import if it determines that any exports or imports made under the general license will not be inimical to the common defense and security or constitute an unreasonable risk to the public health and safety and otherwise meet applicable statutory requirements. A general license is issued as a regulation after a rulemaking proceeding under subpart K of this part. Issuance of a general license is coordinated with the Executive Branch.

49 FR 47191

(c) A general license does not relieve a person from complying with the regulations of other Government agencies applicable to exports or imports under their authority.

(d) A general license for export may not be used if the exporter knows, or has reason to believe, that the material will be used in any activity related to isotope separation, chemical reprocessing, heavy water production or the fabrication of nuclear fuel containing plutonium, unless these activities are generically authorized under an appropriate agreement for cooperation.

59 FR 12999

(e) A person who uses an NRC general license as the authority to export or import may cite on the shipping documents the section of this part which authorizes the described export or import under general license, as a means of expediting U.S. Customs Service's processing of the shipment.

59 FR 48994

(f) As specified in §§ 110.21 through 110.26, 110.28, 110.29, and 110.30, only certain countries are eligible recipients of equipment or material under NRC general licenses to export. The Commission will closely monitor these countries and may at any time remove a country from a general license in response to significant adverse developments in the country involved. A key factor in this regard is the nonproliferation credentials of the importing country.

60 FR 37556

§ 110.21 General license for the export of special nuclear material.

(a) Except as provided in paragraph (d) of this section, a general license is issued to any person to export the following to any country not listed in § 110.28:

49 FR 47191

(1) Low-enriched uranium as residual contamination (17.5 parts per million or less) in any item or substance.

(2) Plutonium containing 80 percent or more by weight of plutonium-238 in cardiac pacemakers.

59 FR 48994

(3) Special nuclear material, other than Pu-236 and Pu-238, in sensing components in instruments, if no more than 3 grams of enriched uranium or 0.1 gram of Pu or U-233 are contained in each sensing component.

(4) Pu-236 and Pu-238 when contained in a device, or a source for use in a device, in quantities of less than 100 millicuries of alpha activity (189 micrograms Pu-236, 5.88 milligrams Pu-238) per device or source.

60 FR 37556

(b) Except as provided in paragraph (d) of this section, a general license is issued to any person to export the following to any country not listed in § 110.28 or § 110.29:

59 FR 48994

(1) Special nuclear material, other than Pu-236 and Pu-238, in individual shipments of 0.001 effective kilogram or less (e.g., 1.0 gram of plutonium, U-233 or U-235, or 10 kilograms of 1 percent enriched uranium), not to exceed 0.1 effective kilogram per year to any one country.

49 FR 47191

(2) Special nuclear material in fuel elements as replacements for damaged or defective unirradiated fuel elements previously exported under a specific license, subject to the same terms as the original export license and the condition that the replaced fuel elements must be returned to the United States within a reasonable time period.

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60 FR 37556

(c) Except as provided in paragraph (d) of this section, a general license is issued to any person to export Pu-236 or Pu-238 to any country listed in § 110.30 in individual shipments of 1 gram or less, not to exceed 100 grams per year to any one country.

(d) The general licenses in paragraphs (a), (b), and (c) of this section do not authorize the export of special nuclear material in radioactive waste.

(e) Persons using the general licenses in paragraphs (a), (b), and (c) of this section as authority to export special nuclear material as incidental radioactive material shall file a completed NRC Form 7 before the export takes place if the total weight of the shipment exceeds 100 kilograms.

59 FR 48994

(1) Uranium or thorium, other than U-230, U-232, Th-227, and Th-228, in any substance in concentrations of less than 0.05 percent by weight.

(2) Thorium, other than Th-227 and Th-228, in incandescent gas mantles or in alloys in concentrations of 5 percent or less.

(3) Th-227, Th-228, U-230, and U-232 when contained in a device, or a source for use in a device, in quantities of less than 100 millicuries of alpha activity (3.12 micrograms Th-227, 122 micrograms Th-228, 3.7 micrograms U-230, 4.7 milligrams U-232) per device or source.

60 FR 37556

(b) Except as provided in paragraph (e) of this section, a general license is issued to any person to export uranium or thorium, other than U-230, U-232, Th-227, or Th-228, in individual shipments of 10 kilograms or less to any country not listed in § 110.28 or § 110.29, not to exceed 1,000 kilograms per year to any one country or 500 kilograms per year to any one country when the uranium or thorium is of Canadian origin.

§ 110.22 General license for the export of source material.

(a) Except as provided in paragraph (e) of this section, a general license is issued to any person to export the following to any country not listed in § 110.28:

61 FR 35600

➤ (c) Except as provided in paragraph (e) of this section, a general license is issued to any person to export uranium or thorium, other than U-230, U-232, Th-227, or Th-228, in individual shipments of 1 kilogram or less to any country listed in § 110.29, not to exceed 100 kilograms per year to any one country.

60 FR 37556

(d) Except as provided in paragraph (e) of this section, a general license is issued to any person to export U-230, U-232, Th-227, or Th-228 in individual shipments of 10 kilograms or less to any country listed in § 110.30, not to exceed 1,000 kilograms per year to any one country or 500 kilograms per year to any one country when the uranium or thorium is of Canadian origin.

(e) Paragraphs (a), (b), (c), and (d) of this section do not authorize the export under general license of source material in radioactive waste.

(f) Persons using the general licenses in paragraphs (a), (b), (c), and (d) of this section as authority to export source material as incidental radioactive material shall file a completed NRC Form 7 before the export takes place if the total weight of the shipment exceeds 100 kilograms.

§ 110.23 General license for the export of byproduct material.

(a) Except as provided in paragraph (d) of this section, a general license is issued to any person to export the following to any country not listed in § 110.28:

➤ (1) All byproduct material (see Appendix L to this part), except actinium-225, actinium-227, americium-241, americium-242m, californium-248, californium-249, californium-250, californium-251, californium-252, curium-240, curium-241, curium-242, curium-243, curium-244, curium-245, curium-246, curium-247, einsteinium-252, einsteinium-253, einsteinium-254, einsteinium-255, fermium-257, gadolinium-148, mendelevium-258, neptunium-237, polonium-208, polonium-209, polonium-210, radium-223, and tritium unless authorized in paragraphs (a)(2) through (a)(6), (b), or (c) of this section.

(2) Actinium-225, actinium-227, californium-248, californium-250, californium-252, curium-240, curium-241, curium-242, curium-243, curium-244, einsteinium-252, einsteinium-253, einsteinium-254, einsteinium-255, fermium-257, gadolinium-148, mendelevium-258, polonium-208, polonium-209, polonium-210, and radium-223 when contained in a device, or a source for use in a device, in quantities of less than 100 millicuries of alpha activity (see § 110.2 for specific activity) per device or source, except that exports of polonium-210 when contained in static eliminators may not exceed 100 curies (22 grams) per individual shipment.

(3) Americium-241, except that exports exceeding one curie (308

milligrams) per shipment or 100 curies (30.8 grams) per year to any country listed in § 110.29 must be contained in industrial process control equipment or petroleum exploration equipment in quantities not to exceed 20 curies (6.16 grams) per device or 200 curies (61.6 grams) per year to any one country.

(4) Neptunium-237 in individual shipments of less than 1 gram, not to exceed 10 grams per year to any one country.

(5) Tritium in any dispersed form (e.g., luminescent light sources and paint, accelerator targets, calibration standards, labeled compounds) in quantities of 10 curies (1.03 milligrams) or less per item, not to exceed 1,000 curies (103 milligrams) per shipment or 10,000 curies (1.03 grams) per year to any one country. This general license does not authorize exports for tritium recovery or recycle purposes.

(6) Tritium in luminescent safety devices installed in aircraft when in quantities of 4 curies (4.12 milligrams) or less per light source.

(b) Except as provided in paragraph (d) of this section, a general license is issued to any person to export to the countries listed in § 110.30 tritium in any dispersed form (e.g., luminescent light sources and paint, accelerator targets, calibration standards, labeled compounds) in quantities of 40 curies (4.12 milligrams) or less per item, not to exceed 1,000 curies (103 milligrams) per shipment or 10,000 curies (1.03 grams) per year to any one country. This general license does not authorize exports for tritium recovery or recycling purposes.

(c) Except as provided in paragraph (d) of this section, a general license is issued to any person to export to the countries listed in § 110.30 actinium-225, actinium-227, californium-248, californium-250, californium-252, curium-240, curium-241, curium-242, curium-243, curium-244, einsteinium-252, einsteinium-253, einsteinium-254, einsteinium-255, fermium-257, gadolinium-148, mendelevium-258, polonium-208, polonium-209, polonium-210, and radium-223, except that polonium-210 when contained in static eliminators must not exceed 100 curies (22 grams) per individual shipment.

(d) Paragraphs (a), (b), and (c) of this section do not authorize the export under general license of byproduct material in radioactive waste.

(e) Persons using the general licenses in paragraphs (a), (b), and (c) of this section as authority to export byproduct material as incidental radioactive material shall file a completed NRC Form 7 before the export takes place if the total weight of the shipment exceeds 100 kilograms.

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58 FR 12999
49 FR 47191
§ 110.24 General license for the export of deuterium.

(a) A general license is issued to any person to export deuterium in individual shipments of 10 kilograms or less (50 kilograms of heavy water) to any country not listed in § 110.28 or § 110.29. No person may export more than 200 kilograms (1000 kilograms of heavy water) per year to any one country.
(b) A general license is issued to any person to export deuterium in individual shipments of 1 kilogram or less (5 kilograms of heavy water) to any country listed in § 110.29. No person may export more than 5 kilograms (25 kilograms of heavy water) per year to any one country.

58 FR 12999
§ 110.25 General license for the export of nuclear grade graphite.

49 FR 49841
(a) A general license is issued to any person to export bulk nonfabricated nuclear grade graphite in individual shipments of 100 kilograms or less to any country not listed in § 110.28. No person may export more than 2,000 kilograms per year to any one country.

58 FR 12999
(b) Unless licensed by the Department of Commerce, a general license is issued to any person to export nuclear grade graphite in fabricated, nonnuclear-related commercial products to any country not listed in § 110.28, except that graphite electrodes weighing more than 1 kilogram per electrode may not be exported to any country listed in § 110.29 under this general license. (Fabricated products are products in final manufactured form except for detailed machining and other final steps necessary for the intended end use of the product.)

58 FR 12999
§ 110.26 General license for the export of nuclear reactor components.

(a) A general license is issued to any person to export to the following countries any nuclear reactor component described in paragraphs (5) through (9) of appendix A to this part if—

(1) The component will be used in a light or heavy water-moderated power or research reactor in those countries, or

➤ (2) The component is in semifabricated form and will be undergoing final fabrication or repair in those countries for subsequent return to the United States for use in a nuclear power or research reactor in the United States:

- | | |
|-----------|----------------|
| Austria | Japan |
| Belgium | Luxembourg |
| Canada | Netherlands |
| Denmark | Philippines |
| Finland | Portugal |
| France | South Korea |
| Germany | Spain |
| Greece | Sweden |
| Indonesia | Switzerland |
| Ireland | Taiwan |
| Italy | United Kingdom |

55 FR 34518
(1) A description of the components keyed to the categories listed in appendix A to this part.

49 FR 47191
(2) Approximate shipment dates.
(3) A list of recipient countries and endusers keyed to the items shipped.

49 FR 47191
(b) This general license does not authorize the export of essentially complete reactors through piecemeal exports of facility components. When individual exports of components would amount in the aggregate to export of an essentially complete nuclear reactor, a facility export license is required.

(c) Persons making exports under the general license established by paragraph (a) of this section shall submit by February 1 of each year one copy of a report of all components shipped during the previous calendar year. This report must include:

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60 FR 37556
§ 110.27 General license for imports.
(a) Except as provided in paragraphs (b) and (c) of this section, a general license is issued to any person to import byproduct, source, or special nuclear material if the consignee is authorized to possess the material under:

51 FR 47207
(1) A contract with the Department of Energy;
(2) An exemption from licensing requirements issued by the Commission; or
(3) A general or specific license issued by the Commission or a State with which the Commission has entered into an agreement under Section 274b. of the Atomic Energy Act.

56 FR 38335
(b) The general license in paragraph (a) of this section does not authorize the import of source or special nuclear material in the form of irradiated fuel that exceeds 100 kilograms per shipment.

60 FR 37556
(c) Paragraph (a) of this section does not authorize the import under general license of radioactive waste, other than radioactive waste that is being returned to a United States Government or military facility in the United States which is authorized to possess the material.

61 FR 35600
(d) A person importing formula quantities of strategic special nuclear material (as defined in § 73.2 of this chapter) under this general license shall provide the notifications required by § 73.27 and § 73.72 of this chapter.

§ 110.28 Embargoed destinations.
Cuba
Iran
Iraq
Libya
North Korea

§ 110.29 Restricted destinations.
Afghanistan
Andorra
Angola
Burma (Myanmar)
Djibouti
India
Israel
Oman
Pakistan
Syria

61 FR 35600
§ 110.30 Members of the Nuclear Suppliers Group.
Argentina
Australia
Austria
Belgium
Brazil
Bulgaria
Canada
Czech Republic
Denmark
Finland
France
Germany
Greece
Hungary
Ireland
Italy
Japan
Luxembourg
Netherlands
New Zealand
Norway
Poland
Portugal
Republic of Korea
Romania
Russia
Slovak Republic
South Africa
Spain
Sweden
Switzerland
Ukraine
United Kingdom

59 FR 48994

§ 110.31 Application for a specific license.

- (a) A person shall file an application for a specific license to export or import with the Director for Nonproliferation, Exports, and Multilateral Relations, Office of International Programs, U.S. Nuclear Regulatory Commission, Washington, DC 20555. The application may be delivered to the Commission's offices at 11555 Rockville Pike, Rockville, Maryland 20852 or at 2120 L Street, NW (Lower Level), Washington, DC 20037.
- (b) An application for a specific license to export or import must be accompanied by the appropriate fee in accordance with the fee schedule in § 170.21 and § 170.31 of this chapter. A license application will not be processed unless the specified fee is received.
- (c) A license application should be filed on NRC Form 7, except that an import license application and a production or utilization facility export license application should be filed by letter.
- (d) Each person shall provide in the license application, as appropriate, the information specified in § 110.32. The Commission also may require the submission of additional information if necessary to complete its review.
- (e) An application may cover multiple shipments and destinations.
- (f) The applicant shall withdraw an application when it is no longer needed. The Commission's official files retain all documents related to a withdrawn application.

60 FR 37556

§ 110.32 Information required in an application for a specific license/NRC Form 7.

59 FR 48994

- (a) Name and address of applicant.
- (b) Name and address of supplier of equipment or material.
- (c) Country of origin of equipment or material, if known.
- (d) Names and addresses of all intermediate and ultimate consignees, other than intermediate consignees performing shipping services only.
- (e) Dates of proposed first and last shipments.
- (f) Description of the equipment or material including, as appropriate, the following:
 - (1) Maximum quantity of material in grams or kilograms (curies for byproduct material) and its chemical and physical form.
 - (2) For enriched uranium, the maximum weight percentage of enrichment and maximum weight of contained U-235.
 - (3) For nuclear equipment, total dollar value.
 - (4) For nuclear reactors, the name of the facility and its design power level.

60 FR 37556

- (5) For proposed exports or imports of radioactive waste, and for proposed exports of incidental radioactive material—the volume, classification (as defined in § 61.55 of this chapter), physical and chemical characteristics, route of transit of shipment, and ultimate disposition (including forms of management) of the waste.
- (6) For proposed imports of radioactive waste—the industrial or other process responsible for generation of the waste, and the status of the arrangements for disposition, e.g., any agreement by a low-level waste compact or State to accept the material for management purposes or disposal.
- (7) Description of end use by all consignees in sufficient detail to permit accurate evaluation of the justification for the proposed export or import, including the need for shipment by the dates specified.

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Subpart D — Review of License Applications

§ 110.40 Commission review.

(a) Immediately after receipt of a license application for an export or import requiring a specific license under this part, the Commission will initiate its licensing review and, to the maximum extent feasible, will expeditiously process the application concurrently with any applicable review by the Executive Branch.

(b) The Commissioners shall review a license application for export of the following:

- (1) A production or utilization facility.
- (2) More than one effective kilogram of high-enriched uranium, plutonium or U-233.
- (3) 1,000 kilograms or more of nuclear grade graphite or deuterium oxide (heavy water), other than exports of heavy water to Canada.
- (4) An export involving assistance to end uses related to isotope separation, chemical reprocessing, heavy water production, advanced reactors, or the fabrication of nuclear fuel containing plutonium, except for exports of source material or low-enriched uranium to EURATOM or Japan for enrichment up to 5 percent in the isotope uranium-235, and those categories of exports which the Commission has approved in advance as constituting permitted incidental assistance.
- (5) The initial export to a country since March 10, 1978 of source or special nuclear material for nuclear end use.
- (6) An export involving over: (i) 10 grams of plutonium, U-233 or high-enriched uranium; (ii) 1 effective kilogram of low-enriched uranium; (iii) 250 kilograms of source material, heavy water or nuclear grade graphite; or (iv) 1,000 curies of tritium, to any country listed in § 110.28 or § 110.29.
- (7) Any export subject to special limitations as determined by the staff or a majority of the Commissioners.

(c) If the Commission has not completed action on a license application within 60 days after receipt of the Executive Branch judgment, as provided for in § 110.41, or the license application when an Executive Branch judgment is not required, it will inform the applicant in writing of the reason for delay and, as appropriate, provide followup reports.

§ 110.41 Executive Branch review.

(a) An application for a license to export the following will be promptly forwarded to the Executive Branch for review:

- (1) A production or utilization facility.
- (2) More than one effective kilogram of high-enriched uranium or 10 grams of plutonium or U-233.
- (3) Nuclear grade graphite, more than 100 curies of tritium, and deuterium oxide (heavy water), other than exports of heavy water to Canada.

➤ (4) One kilogram or more of source or special nuclear material to be exported under the US-IAEA Agreement for Cooperation.

(5) An export involving assistance to end uses related to isotope separation, chemical reprocessing, heavy water production, advanced reactors, or the fabrication of nuclear fuel containing plutonium, except for exports of source material or low-enriched uranium to EURATOM and Japan for enrichment up to 5 percent in the isotope uranium-235, and those categories of exports approved in advance by the Executive Branch as constituting permitted incidental assistance.

(6) The initial export of nuclear material or equipment to a foreign reactor.

(7) An export involving radioactive waste.

(8) An export to any country listed in § 110.28 or § 110.29.

(9) An export subject to special limitations as determined by the Commission or the Executive Branch.

(b) The Executive Branch will be requested to:

(1) Provide its judgment as to whether the proposed export would be inimical to the common defense and security, along with supporting rationale and information.

(2) Where applicable, confirm that the proposed export would be under the terms of an agreement for cooperation; and

(3) Address the extent to which the export criteria in section 110.42 are met, if applicable, and the extent to which the recipient country or group of countries has adhered to the provisions of any applicable agreement for cooperation.

(c) The Commission may request the Executive Branch to address specific concerns and provide additional data and recommendations as necessary.

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§ 110.42 Export licensing criteria.

60 FR 37556
58 FR 12999

(a) The review of license applications for export for peaceful nuclear uses of production or utilization facilities¹ or for export for peaceful nuclear uses of special nuclear or source material requiring a specific license under this part is governed by the following criteria:

(1) IAEA safeguards as required by Article III (2) of the NPT will be applied with respect to any such facilities or material proposed to be exported, to any such material or facilities previously exported and subject to the applicable agreement for cooperation, and to any special nuclear material used in or produced through the use thereof.

(2) No such material or facilities proposed to be exported or previously exported and subject to the applicable agreement for cooperation, and no special nuclear material produced through the use of such material or facilities, will be used for any nuclear explosive device or for research on or development of any nuclear explosive device.

60 FR 37556

(3) Adequate physical security measures will be maintained with respect to such material or facilities proposed to be exported and to any special nuclear material used in or produced through the use thereof. Physical security measures will be deemed adequate if such measures provide a level of protection equivalent to that set forth in § 110.44.

(4) No such material or facilities proposed to be exported, and no special nuclear material produced through the use of such material, will be retransferred to the jurisdiction of any other country or group of countries unless the prior approval of the United States is obtained for such retransfer.

(5) No such material proposed to be exported and no special nuclear material produced through the use of such material will be reprocessed, and no irradiated fuel elements containing such material removed from a reactor will be altered in form or content, unless the prior approval of the United States is obtained for such reprocessing or alteration.

60 FR 37556
58 FR 12999

(6) With respect to exports of such material or facilities to nonnuclear weapon states, IAEA safeguards will be maintained with respect to all peaceful activities in, under the jurisdiction of, or carried out under the control of such state at the time of export. This criterion will not be applied if the Commission has been notified by the President in writing that failure to approve an export because this criterion has not been met would be seriously prejudicial to the achievement of United States nonproliferation objectives or otherwise jeopardize the common defense and security, in which case the provisions of Section 128 of the Atomic Energy Act regarding Congressional review will apply.

(7) The proposed export of a facility or of more than 0.003 effective kilograms of special nuclear material, other than plutonium containing 80 percent or more by weight of plutonium-238, would be under the terms of an agreement for cooperation.

(8) The proposed export is not inimical to the common defense and security and, in the case of facility exports, does not constitute an unreasonable risk to the public health and safety in the United States.

¹ Exports of nuclear reactors, reactor pressure vessels, reactor primary coolant pumps, "on-line" reactor fuel charging and discharging machines, and complete reactor control rod systems, as specified in paragraphs (1) through (4) of appendix A to this part, are subject to the export licensing criteria in § 110.42(a). Exports of nuclear reactor components, as specified in paragraphs (5) through (9) of appendix A to this part, when exported separately from the items described in paragraphs (1) through (4) of appendix A of this part, are subject to the export licensing criteria in § 110.42(b).

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(9) (i) With respect to exports of high-enriched uranium to be used as a fuel or target in a nuclear research or test reactor, the Commission determines that:

(A) There is no alternative nuclear reactor fuel or target enriched to less than 20 percent in the isotope U-235 that can be used in that reactor;

(B) The proposed recipient of the uranium has provided assurances that, whenever an alternative nuclear reactor fuel or target can be used in that reactor, it will use that alternative fuel or target in lieu of highly-enriched uranium; and

(C) The United States Government is actively developing an alternative nuclear reactor fuel or target that can be used in that reactor.

(ii) A fuel or target "can be used" in a nuclear research or test reactor if—

(A) The fuel or target has been qualified by the Reduced Enrichment Research and Test Reactor Program of the Department of Energy; and

(B) Use of the fuel or target will permit the large majority of ongoing and planned experiments and isotope production to be conducted in the reactor without a large percentage increase in the total cost of operating the reactor.

(c) Except where paragraph (d) is applicable, the review of license applications for export of byproduct material or for export of source material for non-nuclear end uses requiring a specific license under this part is governed by the criterion that the proposed export is not inimical to the common defense and security.

(d) The review of license applications for the export of radioactive waste requiring a specific license under this part is governed by the following criteria:

(1) The proposed export is not inimical to the common defense and security.

(2) The receiving country, after being advised of the information required by § 110.32(f)(5), finds that it has the administrative and technical capacity and regulatory structure to manage and dispose of the waste and consents to the receipt of the radioactive waste. In the case of radioactive waste containing a nuclear material to which paragraph (a) or (b) of this section is applicable, the criteria in this paragraph (d) shall be in addition to the criteria provided in paragraph (a) or (b) of this section.

§ 110.43 Import licensing criteria.

The review of license applications for imports requiring a specific license under this part is governed by the following criteria:

(a) The proposed import is not inimical to the common defense and security.

(b) The proposed import does not constitute an unreasonable risk to the public health and safety.

(c) Any applicable requirements of subpart A of part 51 of this chapter are satisfied.

(d) With respect to the import of radioactive waste, an appropriate facility has agreed to accept the waste for management or disposal.

(b) The review of license applications for the export of nuclear equipment, other than a production or utilization facility, and for deuterium and nuclear grade graphite, is governed by the following criteria:

(1) IAEA safeguards as required by Article III (2) of the NPT will be applied with respect to such equipment or material.

(2) No such equipment or material will be used for any nuclear explosive device or for research on or development of any nuclear explosive device.

(3) No such equipment or material will be retransferred to the jurisdiction of any other country or group of countries without the prior consent of the United States.

(4) The proposed export is not inimical to the common defense and security.

§ 110.44 Physical security standards.

(a) Physical security measures in recipient countries must provide protection at least comparable to the recommendations in the current version of IAEA publication INFCIRC/225/Rev.2, December 1989, "The Physical Protection of Nuclear Material," and is incorporated by reference in this part. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Notice of any changes made to the material incorporated by reference will be published in the **Federal Register**. Copies of INFCIRC/225/Rev.2 may be obtained from the Director for Nonproliferation, Exports, and Multilateral Relations, Office of International Programs, U.S. Nuclear Regulatory Commission, Washington, DC 20555, and are available for inspection at the NRC library, 11545 Rockville Pike, Rockville, Maryland 20852-2738. A copy is available for inspection at the library of the Office of the Federal Register, 800 N. Capitol Street, NW., suite 700, Washington, DC.

(b) **Commission determinations on the adequacy of physical security measures are based on—**

(1) **Receipt of written assurances from recipient countries that physical security measures providing protection at least comparable to the recommendations set forth in INFCIRC/225/Rev.2 will be maintained; and**

➤ (2) **Information obtained through country visits, information exchanges, or other sources. Determinations are made on a country-wide basis and are subject to continuing review. Appendix M to this part describes the different categories of nuclear material to which physical security measures are applied.**

§ 110.45 Issuance or denial of licenses.

(a) The Commission will issue an export license if it has been notified by the State Department that it is the judgment of the Executive Branch that the proposed export will not be inimical to the common defense and security; and—

(1) Finds, based upon a reasonable judgment of the assurances provided and other information available to the Federal government, that the applicable criteria in § 110.42, or their equivalent, are met. (If an Executive Order provides an exemption pursuant to section 126a of the Atomic Energy Act, proposed exports to EURATOM countries are not required to meet the criteria in § 110.42(a) (4) and (5)); or

(2) Finds that there are no material changed circumstances associated with an export license application (except for byproduct material applications) from those existing at the time of issuance of a prior license to export to the same country, if the prior license was issued under the provisions of paragraph (a)(1) of this section.

(b) The Commission will issue an import license if it finds that:

(1) The proposed import will not be inimical to the common defense and security;

(2) The proposed import will not constitute an unreasonable risk to the public health and safety;

(3) The requirements of subpart A of part 51 of this chapter (to the extent applicable to the proposed import) have been satisfied; and

(4) With respect to a proposed import of radioactive waste, an appropriate facility has agreed to accept the waste for management or disposal.

(c) If, after receiving the Executive Branch judgement that the issuance of a proposed export license will not be inimical to the common defense and security, the Commission does not issue the proposed license on a timely basis because it is unable to make the statutory determinations required under the Atomic Energy Act, the Commission will publicly issue a decision to that effect and will submit license application to the President. The Commission's decision will include an explanation of the basis for the decision and any dissenting or separate views. The provisions in this paragraph do not apply to Commission decisions regarding license applications for the export of byproduct material or radioactive waste requiring a specific license.

(d) The Commission will deny: (1) Any export license application for which the Executive Branch judgment does not recommend approval; (2) any byproduct material export license application for which the Commission is unable to make the finding in paragraph (a)(1) of this section; or (3) any import license application for which the Commission is unable to make the finding in paragraph (b) of this section. The applicant will be notified in writing of the reason for denial.

§ 110.46 Conduct resulting in termination of nuclear exports.

(a) Except as provided in paragraph (c) of this section, no license will be issued to export nuclear equipment or material, other than byproduct material, to any nonnuclear weapon state that is found by the President to have, after March 10, 1978:

- (1) Detonated a nuclear explosive device;
- (2) Terminated or abrogated IAEA safeguards;
- (3) Materially violated an IAEA safeguards agreement; or
- (4) Engaged in activities involving source or special nuclear material and having direct significance for the manufacture or acquisition of nuclear explosive devices, and failed to take steps which represent sufficient progress toward terminating such activities.

(b) Except as provided in paragraph (c) of this section, no license will be issued to export nuclear equipment or material, other than byproduct material, to any country or group of countries that is found by the President to have, after March 10, 1978:

- (1) Materially violated an agreement for cooperation with the United States or the terms of any other agreement under which nuclear equipment or material has been exported;
- (2) Assisted, encouraged or induced any non-nuclear weapon state to engage in activities involving source or special nuclear material and having direct significance for the manufacture or acquisition of nuclear explosive devices, and failed to take steps which represent sufficient progress toward terminating such assistance, encouragement or inducement; or
- (3) Entered into an agreement for the transfer of reprocessing equipment, materials or technology to the sovereign control of a non-nuclear weapon state, except in connection with an international fuel cycle evaluation in which the United States is a participant or pursuant to an international agreement or understanding to which the United States subscribes.

(c) Under section 129 of the Atomic Energy Act, the President may waive the requirement for the termination of exports to a country described in paragraph (a) or (b) of this section after determining in writing that the cessation of exports would seriously prejudice the achievement of United States nonproliferation objectives or otherwise jeopardize the common defense and security. If the President makes this determination, the Commission will issue licenses to export to that country, if other applicable statutory provisions are met.

Subpart E — License Terms and Related Provisions

§ 110.50 Terms.

(a) General and specific licenses.

(1) Each license is subject to all applicable provisions of the Atomic Energy Act and to all applicable rules, regulations, decisions and orders of the Commission.

(2) Each license is subject to amendment, suspension, revocation or incorporation of separate conditions when required by amendments of the Atomic Energy Act or other applicable law, or by other rules, regulations, decisions or orders issued in accordance with the terms of the Atomic Energy Act or other applicable law.

(3) Each license authorizes export or import only and does not authorize any person to receive title to, acquire, receive, possess, deliver, use or transfer nuclear equipment or material.

(4) Each nuclear material license authorizes the export or import of only the nuclear material and accompanying packaging and fuel element hardware.

(5) No nuclear equipment license confers authority to export or import nuclear material.

(6) Each nuclear equipment export license authorizes the export of only those items required for use in the foreign nuclear installation for which the items are intended.

(7) A licensee shall not proceed to export or import and shall notify the Commission promptly if he knows or has reason to believe that the packaging requirements of Part 71 of this chapter have not been met.

(b) Specific licenses.

(1) Each specific license will have an expiration date.

(2) A licensee may export or import only for the purpose stated in the license application.

(3) Unless a license specifically authorizes the export of foreign-origin nuclear material or equipment, a licensee shall notify in writing the Director for Nonproliferation, Exports, and Multilateral Relations at least 40 days prior to export of Australian-origin or Canadian-origin nuclear material or equipment. A licensee may not ship this material or equipment until authorized by the Director for Nonproliferation, Exports, and Multilateral Relations. The Director for Nonproliferation, Exports, and Multilateral Relations will not authorize shipment until after obtaining the consent of the Australian Government for Australian-origin material or the Canadian Government for Canadian-origin material.

(4) A licensee authorized to export or import nuclear material is responsible for compliance with applicable requirements of Parts 40, 70, and 73 of this chapter, unless a domestic licensee of the Commission has assumed that responsibility and the Commission has been so notified.

(5) A license may be transferred, disposed of or assigned to another person only with the approval of the Commission by license amendment.

§ 110.51 Amendment and renewal of licenses.

(a) A licensee may submit an application to renew a license or to amend a license.

(b) If an application to renew a license is submitted 30 days or more before the license expires, the license remains valid until the Commission acts on the renewal application. An expired license is not renewable.

(c) An amendment is not required for—

(1) Changes in value (but not amount or quantity);

(2) Changes in the mailing addresses within the same countries of intermediate or ultimate consignees; or

(3) The addition of intermediate consignees in any of the importing countries specified in the license (for a nuclear equipment license only).

(d) In acting upon license renewal and amendment applications, the Commission will use, as appropriate, the same procedures and criteria it uses for original license applications.

§ 110.52 Revocation, suspension, and modification.

(a) A license may be revoked, suspended, or modified for a condition which would warrant denial of the original license application.

(b) The Commission may require further information from a licensee to determine whether a license should be revoked, suspended, or modified.

(c) Except when the common defense and security or public health and safety requires otherwise, no license will be revoked, suspended, or modified before the licensee is informed in writing of the grounds for such action and afforded the opportunity to reply and be heard under procedures patterned on those in subpart J.

§ 110.53 United States address, records, and inspections.

(a) Each licensee shall have an office in the United States where papers may be served and where records required by the Commission will be maintained.

(b)(1) Each licensee shall maintain records concerning his exports or imports. The licensee shall retain these records for five years after each export or import except that byproduct material records must be retained for three years after each export or import.

(2) Records which must be maintained pursuant to this part may be the original or a reproduced copy or microform if such reproduced copy or microform is duly authenticated by authorized personnel and the microform is capable of producing a clear and legible copy after storage for the period specified by

Commission regulations. The record may also be stored in electronic media with the capability for producing legible, accurate, and complete records during the required retention period. Records such as letters, drawings, specifications, must include all pertinent information such as stamps, initials, and signatures. The licensee shall maintain adequate safeguards against tampering with and loss of records.

(c) Each licensee shall permit the Commission to inspect his records, premises, and activities pertaining to his exports and imports when necessary to fulfill the requirements of the Atomic Energy Act.

Subpart F — Violations and Enforcement**§ 110.60 Violations.**

(a) The Commission may obtain an injunction or other court order to prevent a violation of the provisions of—

(1) The Atomic Energy Act of 1954, as amended;

(2) Title II of the Energy Reorganization Act of 1974, as amended; or

(3) A regulation or order issued pursuant to those Acts.

(b) The Commission may obtain a court order for the payment of a civil penalty imposed under section 234 of the Atomic Energy Act:

(1) For violations of—

(i) Sections 53, 57, 62, 63, 81, 82, 101, 103, 104, 107, or 109 of the Atomic Energy Act of 1954, as amended;

(ii) Section 206 of the Energy Reorganization Act;

(iii) Any rule, regulation, or order issued pursuant to the sections specified in paragraph (b)(1)(i) of this section;

(iv) Any term, condition, or limitation of any license issued under the sections specified in paragraph (b)(1)(i) of this section.

(2) For any violation for which a license may be revoked under section 186 of the Atomic Energy Act of 1954, as amended.

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§ 110.61 Notice of violation.

(a) Before instituting any enforcement action the Commission will serve on the licensee written notice of violation, except as provided in paragraph (d).

(b) The notice will state the alleged violation; require the licensee to respond in writing, within 20 days or other specified time; and may also require the licensee to state the corrective steps taken or to be taken and the date when full compliance will be achieved.

(c) The notice may provide that, if an adequate and timely reply is not received, an order to show cause may be issued pursuant to § 110.62 or a proceeding instituted to impose a civil penalty pursuant to § 110.64.

(d) The notice may be omitted and an order to show cause issued when the Commission determines that the violation is willful or that the public health, safety, or interest so requires.

§ 110.62 Order to show cause.

(a) In response to an alleged violation, described in § 110.60, the Commission may institute a proceeding to revoke, suspend, or modify a license by issuing an order to show cause:

(1) Stating the alleged violation and proposed enforcement action; and

(2) Informing the licensee of his right, within 20 days or other specified time, to file a written answer and demand a hearing.

(b) An answer consenting to the proposed enforcement action shall constitute a waiver by the licensee of a hearing and of all rights to seek further Commission or judicial review.

(c) The order to show cause may be omitted and an order issued to revoke, suspend, or modify the license in cases where the Commission determines that the violation is willful or that the public health, safety, or interest so requires.

§ 110.63 Order for revocation, suspension, or modification.

(a) In response to an alleged violation described in § 110.60, the Commission may revoke, suspend, or modify a license by issuing an order:

(1) Stating the violation and the effective date of the proposed enforcement action; and

(2) Informing the licensee of his right, within 20 days or other specified time, to file a written answer and demand a hearing.

(b) If an answer is not filed within the time specified, the enforcement action will become effective and permanent as proposed.

(c) If a timely answer is filed, the Commission, after considering the answer, will issue an order dismissing the proceeding, staying the effectiveness of the order or taking other appropriate action.

(d) The order may be made effective immediately, with reasons stated, pending further hearing and order, when the Commission determines that the violation is willful or that the public health, safety, or interest so requires.

§ 110.64 Civil penalty.

(a) In response to a violation, the Commission may institute a proceeding to impose a civil penalty under section 234 of the Atomic Energy Act by issuing a notice to the licensee:

(1) Stating the alleged violation and the amount of the proposed penalty;

(2) Informing the licensee of his right, within 20 days or other specified time, to file a written answer; and

(3) Advising that a delinquent payment for a subsequently imposed penalty may be referred to the Attorney General for collection pursuant to section 234c. of the Atomic Energy Act.

(b) If an answer is not filed within the time specified, the Commission will issue an order imposing the proposed penalty.

(c) If a timely answer is filed, the Commission, after considering the answer, will issue an order dismissing the proceeding or imposing a penalty subject to any required hearing.

(d) If an order imposing a civil penalty is issued, the licensee may request a hearing within 20 days or other specified time.

(e) Except when the matter has been referred to the Attorney General for

collection, payment of penalties shall be made by check, draft, or money order payable to the Treasurer of the United States, and mailed to the Secretary, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555.

(f) An enforcement action to impose a civil penalty will not itself revoke, modify, or suspend any license under this part.

§ 110.65 Settlement and compromise.

At any time after issuance of an order for any enforcement action under this subpart, an agreement may be entered into for settlement of the proceeding or compromise of a penalty. Upon approval by the Commission, or presiding officer if a hearing has been requested, the terms of the settlement or compromise will be embodied in the order disposing of the enforcement action.

§ 110.66 Enforcement hearing.

(a) If the licensee demands a hearing, the Commission will issue an order specifying the time and place.

(b) A hearing pursuant to this subpart will be conducted under the procedures in subpart G of Part 2.

§ 110.67 Criminal penalties.

(a) Section 223 of the Atomic Energy Act of 1954, as amended, provides for criminal sanctions for willful violation of, attempted violation of, or conspiracy to violate, any regulation issued under sections 161b, 161i, or 161o of the Act. For purposes of section 223, all the regulations in part 110 are issued under one or more of sections 161b, 161i, or 161o, except for the sections listed in paragraph (b) of this section.

(b) The regulations in part 110 that are not issued under sections 161b, 161i, or 161o for the purposes of section 223 are as follows: §§ 110.1, 110.2, 110.3, 110.4, 110.7, 110.10, 110.11, 110.30, 110.31, 110.32, 110.40, 110.41, 110.42, 110.43, 110.44, 110.45, 110.46, 110.51, 110.52, 110.60, 110.61, 110.62, 110.63, 110.64, 110.65, 110.66, 110.67, 110.70, 110.71, 110.72, 110.73, 110.80, 110.81, 110.82, 110.83, 110.84, 110.85, 110.86, 110.87, 110.88, 110.89, 110.90, 110.91, 110.100, 110.101, 110.102, 110.103, 110.104, 110.105, 110.106, 110.107, 110.108, 110.109, 110.110, 110.111, 110.112, 110.113, 110.120, 110.122, 110.124, 110.130, 110.131, 110.132, 110.133, 110.134, and 110.135.

Subpart G — Public Notification and Availability of Documents and Records

§ 110.70 Public notice of receipt of an application.

(a) The Commission will notice the receipt of each license application for an export or import for which a specific license is required by placing a copy in the Public Document Room.

(b) The Commission will also publish in the **Federal Register** a notice of receipt of an application for a license to export the following:

- (1) A production or utilization facility.
- (2) Five effective kilograms or more of plutonium, high-enriched uranium or uranium-233.
- (3) 10,000 kilograms or more of heavy water or nuclear grade graphite.

(4) Radioactive waste.

(c) The Commission will also publish in the **Federal Register** a notice of receipt of a license application for an import of radioactive waste for which a specific license is required.

(d) Periodic lists of applications received may be obtained upon request addressed to the Public Document Room, U.S. Nuclear Regulatory Commission, Washington, DC 20555.

§ 110.71 Notice of withdrawal of an application.

The Commission will notice the withdrawal of an application by placing a copy of the withdrawal request in the Public Document Room.

§ 110.72 Availability of documents in the Public Document Room.

Unless exempt from disclosure under part 9 of this chapter, the following documents pertaining to each license and license application for an import or export requiring a specific license under this Part will be made available in the Public Document Room:

- (a) The license application and any requests for amendments;
- (b) Commission correspondence with the applicant or licensee;
- (c) **FEDERAL REGISTER** notices;
- (d) The Commission letter requesting Executive Branch views;
- (e) Correspondence from the State Department with Executive Branch views;
- (f) Correspondence from foreign governments and international organizations;
- (g) Filings pursuant to subpart I and Commission and Executive Branch responses, if any;
- (h) If a hearing is held, the hearing record and decision;
- (i) A statement of staff conclusions; and
- (j) The license, requests for license amendments and amendments.

§ 110.73 Availability of NRC records.

(a) Commission records under this part will be made available to the public only in accordance with part 9 of this chapter.

(b) Proprietary information provided under this part may be protected under part 9 and § 2.790 (b), (c), and (d) of this chapter.

Subpart H — Public Participation Procedures Concerning License Applications

§ 110.80 Basis for hearings.

The procedures in this Part will constitute the exclusive basis for hearings on export license applications.

§ 110.81 Written comments.

(a) The Commission encourages written comments from the public regarding export and import license applications. The Commission will consider and, if appropriate, respond to these comments.

(b) If possible, these comments should be submitted within 30 days after public notice of receipt of the application and addressed to the Secretary, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Chief, Docketing and Service Branch.

(c) The Commission will provide the applicant with a copy of the comments and, if appropriate, a reasonable opportunity for response.

§ 110.82 Hearing request or intervention petition.

(a) A person may request a hearing or petition for leave to intervene on a license application for an import or export requiring a specific license.

(b) Hearing requests and intervention petitions must—

- (1) State the name, address and telephone number of the requestor or petitioner;
- (2) Set forth the issues sought to be raised;

(3) Explain why a hearing or an intervention would be in the public interest and how a hearing or intervention would assist the Commission in making the determinations required by § 110.45.

(4) Specify, when a person asserts that his interest may be affected, both the facts pertaining to his interest and how it may be affected, with particular reference to the factors in § 110.84.

(c) Hearing requests and intervention petitions will be considered timely only if filed not later than:

(1) 30 days after notice of receipt in the **FEDERAL REGISTER**, for those applications published in the **FEDERAL REGISTER**;

(2) 15 days after notice of receipt in the Public Document Room, for all other applications; or

(3) Such other time as may be provided by the Commission:

§ 110.83 Answers and replies.

(a) Unless otherwise specified by the Commission, an answer to a hearing request or intervention petition may be filed within 30 days after the request or petition has been served.

(b) Unless otherwise specified by the Commission, a reply to an answer may be filed within 10 days after all timely answers have been filed.

(c) Answers and replies should address the factors in § 110.84.

§ 110.84 Commission action on a hearing request or intervention petition.

(a) In an export licensing proceeding, or in an import licensing proceeding in which a hearing request or intervention petition does not assert or establish an interest which may be affected, the Commission will consider:

(1) Whether a hearing would be in the public interest; and

(2) Whether a hearing would assist the Commission in making the statutory determinations required by the Atomic Energy Act.

(b) If a hearing request or intervention petition asserts an interest which may be affected, the Commission will consider:

(1) The nature of the alleged interest;

(2) How that interest relates to issuance or denial; and

(3) The possible effect of any order on that interest, including whether the relief requested is within the Commission's authority, and, if so, whether granting relief would redress the alleged injury.

(c) Untimely hearing requests or intervention petitions may be denied unless good cause for failure to file on time is established. In reviewing untimely requests or petitions, the Commission will also consider:

(1) The availability of other means by which the requestor's or petitioner's interest, if any, will be protected or represented by other participants in a hearing; and

(2) The extent to which the issues will be broadened or action on the application delayed.

(d) Before granting or denying a hearing request or intervention petition, the Commission will review the Executive Branch's views on the license application and may request further information from the petitioner, requester, the Commission staff, the Executive Branch or others.

(e) The Commission will deny a request or petition that pertains solely to matters outside its jurisdiction.

(f) If an issue has been adequately explored in a previous licensing hearing conducted pursuant to this part, a request for a new hearing in connection with that issue will be denied unless:

(1) A hearing request or intervention petition establishes that an interest may be affected; or

(2) The Commission determines that changed circumstances or new information warrant a new hearing.

(g) After consideration of the factors covered by paragraphs (a) through (f), the Commission will issue a notice or order granting or denying a hearing request or intervention petition. Upon the affirmative vote of two Commissioners a hearing will be ordered. A notice granting a hearing will be published in the *FEDERAL REGISTER* and will specify whether the hearing will be oral or consist of written comments. A denial notice will set forth the reasons for denial.

§ 110.85 Notice of hearing consisting of written comments.

(a) A notice of hearing consisting of written comments will:

(1) State the issues to be considered;

(2) Provide the names and addresses of participants;

(3) Specify the time limits for participants and others to submit written views and respond to any written comments; and

(4) State any other instructions the Commission deems appropriate.

(b) The Secretary will give notice of any hearing under this section and § 110.86 to any person who so requests.

§ 110.86 Notice of oral hearing.

(a) A notice of oral hearing will:

(1) State the time, place and issues to be considered;

(2) Provide names and addresses of participants;

(3) Designate the presiding officer;

(4) Specify the time limit for participants and others to indicate whether they wish to present views; and

(5) State any other instructions the Commission deems appropriate.

(b) If the Commission is not the presiding officer, the notice of oral hearing will also state:

(1) When the jurisdiction of the presiding officer commences and terminates;

(2) The powers of the presiding officer; and

(3) Instructions to the presiding officer to certify promptly the completed hearing record to the Commission without preliminary decision or findings, unless the Commission directs otherwise.

§ 110.87 Conditions in a notice or order.

(a) A notice or order granting a hearing or permitting intervention may restrict irrelevant or duplicative testimony, or require common interests to be represented by a single spokesman.

(b) If a participant's interests do not extend to all the issues in the hearing, the notice or order may limit his participation accordingly.

(c) Unless authorized by the Commission, the granting of participation will not broaden the hearing issues.

§ 110.88 Authority of the Secretary.

The Secretary is authorized to prescribe time schedules and other procedural arrangements, when not covered by this part, and rule on related procedural requests.

§ 110.89 Filing and service.

(a) Hearing requests, intervention petitions, answers, replies and accompanying documents must be filed with the Commission by delivery or by mail or telegram to the Secretary, U.S. Nuclear Regulatory Commission, Washington, DC 20555, ATTN: Chief, Docketing and Service Branch. Filing by mail or telegram is complete upon deposit in the mail or with a telegraph company.

(b) All filing and Commission notices and orders must be served upon the applicant; the General Counsel, U.S. Nuclear Regulatory Commission, Washington, DC 20555; the Executive Secretary, Department of State, Washington, DC 20520; and participants if any. Hearing requests, intervention petitions, and answers and replies must be served by the person filing those pleadings.

(c) Service is completed by:

(1) Delivering the paper to the person; or leaving it in his office with someone in charge; or, if there is no one in charge, leaving it in a conspicuous place in the office; or, if he has no office or it is closed, leaving it at his usual place of residence with some occupant of suitable age and discretion;

(2) Depositing it with a telegraph company, properly addressed and with charges prepaid;

(3) Depositing it in the United States mail, properly stamped and addressed; or

(4) Any other manner authorized by law, when service cannot be made as provided in subparagraphs (1) through (3).

(d) Proof of service, stating the name and address of the person served and the manner and date of service, shall be shown, and may be made by—

(1) Written acknowledgment of the person served or an authorized representative; or

(2) The certificate or affidavit of the person making the service.

(e) The Commission may make special provisions for service when circumstances warrant.

§ 110.90 Computation of time.

(a) In computing time, the first day of a designated time period is not included and the last day is included. If the last day is a Saturday, Sunday or legal holiday at the place where the required action is to be accomplished, the time period will end on the next day which is not a Saturday, Sunday or legal holiday.

(b) In time periods of 7 days or less, Saturdays, Sundays and holidays are not counted.

(c) Whenever an action is required within a prescribed period by a paper served pursuant to § 110.89, 3 days shall be added to the prescribed period if service is by mail.

(d) An interpretation of this section contained in § 8.3 of this chapter.

§ 110.91 Commission consultations.

The Commission may consult at any time on a license application with the staff, the Executive Branch or other persons.

Subpart I — Hearings**§ 110.100 Public hearings.**

Hearings under this part will be public unless the Commission decides otherwise.

§ 110.101 Filing and service.

Filing and service of hearing documents shall be pursuant to § 110.89.

§ 110.102 Hearing docket.

For each hearing, the Secretary will maintain a docket which will include the hearing transcript, exhibits and all papers filed or issued pursuant to the hearing.

§ 110.103 Acceptance of hearing documents.

(a) Each document filed or issued must be clearly legible and bear the docket number, license application number and hearing title.

(b) Each document shall be filed in one original and signed by the participant or his authorized representative, with his address and date of signature indicated. The signature is a representation that the document is submitted with full authority, the signator knows its contents and that, to the best of his knowledge, the statements made in it are true.

(c) A document not meeting the requirements of this section may be returned with an explanation for nonacceptance and, if so, will not be docketed.

§ 110.104 Presiding officer.

(a) The full Commission will ordinarily be the presiding officer at a hearing under this part. However, the Commission may provide in a hearing notice that one or more Commissioners, or any other person as provided by law, will preside.

(b) A participant may submit a written motion for the disqualification of any person presiding. The motion shall be supported by affidavit setting forth the alleged grounds for disqualification. If the presiding officer does not grant the motion or the person does not disqualify himself, the Commission will decide the matter.

(c) If any presiding officer designated by the Commission deems himself disqualified, he shall withdraw by notice on the record after notifying the Commission.

(d) If a presiding officer becomes unavailable, the Commission will designate a replacement.

(e) Any motion concerning the designation of a replacement presiding officer shall be made within 5 days after the designation.

(f) Unless otherwise ordered by the Commission, the jurisdiction of a presiding officer other than the Commission commences as designated in the hearing notice and terminates upon certification of the hearing record to the Commission, or when the presiding officer is disqualified.

§ 110.105 Responsibility and power of the presiding officer in an oral hearing.

(a) The presiding officer in any oral hearing shall conduct a fair hearing, develop a record that will contribute to informed decisionmaking, and, within the framework of the Commission's orders, have the power necessary to achieve these ends, including the power to:

- (1) Take action to avoid unnecessary delay and maintain order;
- (2) Dispose of procedural requests;
- (3) Question participants and witnesses, and entertain suggestions as to questions which may be asked of participants and witnesses;
- (4) Order consolidation of participants;
- (5) Establish the order of presentation;
- (6) Hold conferences before or during the hearing;
- (7) Establish reasonable time limits;
- (8) Limit the number of witnesses; and
- (9) Strike or reject duplicative or irrelevant presentations.

(b) Where the Commission itself does not preside:

(1) The presiding officer may certify questions or refer rulings to the Commission for decision;

(2) Any hearing order may be modified by the Commission; and

(3) The presiding officer will certify the completed hearing record to the Commission, which may then issue its opinion on the hearing or provide that additional testimony be presented.

§ 110.106 Participation in a hearing.

(a) Unless otherwise limited by this part or by the Commission, participants in a hearing may submit:

(1) Initial and concluding written statements of position on the issues;

(2) Written questions to the presiding officer; and

(3) Written responses and rebuttal testimony to the statements of other participants.

(b) Participants in an oral hearing may also submit oral statements, questions, responses and rebuttal testimony.

(c) A participant in an import licensing hearing establishing that his interest may be affected, may be accorded additional procedural rights under Subpart G of Part 2 with respect to resolution of domestic factual issues regarding the public health, safety and environment of the United States, and the protection of the United States public against domestic theft, diversion or sabotage, to the extent that such issues are separable from the nondomestic issues associated with the license application.

§ 110.107 Presentation of testimony in an oral hearing.

(a) All direct testimony in an oral hearing shall be filed no later than 7 days before the hearing or as otherwise ordered or allowed.

(b) Written testimony will be received into evidence in exhibit form.

(c) Unless proscribed under § 110.87, members of groups which are designated as participants may testify in their individual capacities.

(d) Participants may present their own witnesses.

(e) Testimony by the Commission and the Executive Branch will be presented only by persons officially designated for that purpose.

(f) Participants and witnesses will be questioned orally or in writing and only by the presiding officer. Questions may be addressed to individuals or to panels of participants or witnesses.

(g) The presiding officer may accept written testimony from a person unable to appear at the hearing, and may request him to respond to questions.

(h) No subpoenas will be granted at the request of participants for attendance and testimony of participants or witnesses or the production of evidence.

§ 110.108 Appearance in an oral hearing.

(a) A participant may appear in a hearing on his own behalf or be represented by an authorized representative.

(b) A person appearing shall file a written notice stating his name, address and telephone number, and if an authorized representative, the basis of his eligibility and the name and address of the participant on whose behalf he appears.

(c) A person may be excluded from a hearing for disorderly, dilatory or contemptuous conduct, provided he is informed of the grounds and given an opportunity to respond.

§ 110.109 Motions and requests.

(a) Motions and requests shall be addressed to the presiding officer, and, if written, also filed with the Secretary and served on other participants.

(b) Other participants may respond to the motion or request. Responses to written motions or requests shall be filed within 5 days after service.

(c) When the Commission does not preside, in response to a motion or request, the presiding officer may refer a ruling or certify a question to the Commission for decision and notify the participants.

(d) Unless otherwise ordered by the Commission, a motion or request, or the certification of a question or referral of a ruling, shall not stay or extend any aspect of the hearing.

§ 110.110 Default.

When a participant fails to act within a specified time, the presiding officer may consider him in default, issue an appropriate ruling and proceed without further notice to the defaulting participant.

§ 110.111 Waiver of a rule or regulation.

(a) A participant may petition that a Commission rule or regulation be waived with respect to the license application under consideration.

(b) The sole ground for a waiver shall be that, because of special circumstances concerning the subject of the hearing, application of a rule or regulation would not serve the purposes for which it was adopted.

(c) Waiver petition shall specify why application of the rule or regulation would not serve the purposes for which it was adopted.

(d) Other participants may, within 10 days, file a response to a waiver petition.

(e) When the Commission does not preside, the presiding officer will certify the waiver petition to the Commission, which, in response, will grant or deny the waiver or direct any further proceedings.

(f) Regardless of whether a waiver is granted or denied, a separate petition for rulemaking may be filed pursuant to Subpart L of this part.

§ 110.112 Reporter and transcript for an oral hearing.

(a) A reporter designated by the Commission will record an oral hearing and prepare the official hearing transcript.

(b) Except for any classified portions, transcripts will be placed in the Public Document Room, and copies may be purchased from the Secretary, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555.

(c) Corrections of the official transcript may be made only as specified by the Secretary.

§ 110.113 Commission action.

(a) Upon completion of a hearing, the Commission will issue a written opinion including its decision on the license application, the reasons for the decision and any dissenting views.

(b) While the Commission will consider fully the hearing record, the licensing decision will be based on all relevant information, including information which might go beyond that in the hearing record.

(c) If the Commission considers information not in the hearing record in reaching its licensing decision, the hearing participants will be informed and, if not classified or otherwise privileged, the information will be placed in the Public Document Room and furnished to the participants.

(d) The Commission may issue a license before completion of a hearing if it finds that:

(1) Prompt issuance is required in the public interest, particularly the common defense and security; and

(2) A participant establishing that his interest may be affected has been provided a fair opportunity to present his views.

(e) The Commission may:

(1) Defer any hearing;

(2) Consolidate applications for hearing;

(3) Narrow or broaden the hearing issues; and

(4) Take other action, as appropriate.

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Subpart J — Special Procedures for Classified Information in Hearings**§ 110.120 Purpose and scope.**

(a) This subpart contains special procedures concerning access to, and introduction of, classified information into hearings under this part.

(b) These procedures do not in any way apply to classified information exchanged between the Executive Branch and the Commission not introduced into a hearing. Such information will be declassified to the maximum extent feasible. The public statements of the Commission staff and Executive Branch will, to the extent consistent with classification requirements, reflect consideration of any such classified information.

§ 110.121 Security clearances and access to classified information.

(a) No person without a security clearance will have access to classified information.

(b) Only the Commission will act upon an application for access to classified information.

(c) To the extent practicable, applications for access to classified information shall describe the information to which access is desired and its level of classification (confidential, secret or other); the reasons for requesting access; the names of individuals for whom access is requested; and the reasons why access is requested for those individuals.

(d) The Commission will consider requests for appropriate security clearances in reasonable numbers; conduct its review and grant or deny these in accordance with Part 10 of this chapter; and make a reasonable charge to cover costs.

(e) The Commission will not grant security clearances for access to classified information, unless it determines that the available unclassified information is inadequate on the subject matter involved.

(f) When an application demonstrates that access to classified information not introduced into a hearing may be needed to prepare a participant's position on the hearing issues, the Commission may issue an order granting access to this information to the participant, his authorized representative or other persons. Access will be subject to the conditions in paragraphs (e) and (j) and will not be granted unless required security clearances have been obtained.

(g) Once classified information has been introduced into a hearing, the Commission will grant access to a participant, his authorized representative or such other persons as the Commission determines may be needed by the participant to prepare his position on the hearing issues. Access will be subject to the conditions in paragraph (e) and (j) and will not be granted unless required security clearances have been obtained.

(h) For good cause, the Commission may postpone action upon an application for access to classified information.

(i) The Commission will grant access to classified information only up to the level for which the persons described in paragraphs (f) and (g) of this section are cleared and only upon an adequate commitment by them not to disclose such information subject to penalties as provided by law.

(j) The Commission will not in any circumstances grant access to classified information:

(1) Unless it determines that the grant is not inimical to the common defense and security; and

(2) Which it has received from another Government agency, without the prior consent of the originating agency.

(k) Upon completion of a hearing, the Commission will terminate all security clearances granted pursuant to the hearing and may require the disposal of classified information to which access has been granted or the observance of other procedures to safeguard this information.

§ 110.122 Classification assistance.

On the request of any hearing participant or the presiding officer (if other than the Commission), the Commission will designate a representative to advise and assist the presiding officer or the participants with respect to security classification of information and the protective requirements to be observed.

§ 110.123 Notice of intent to introduce classified information.

(a) A participant shall seek the required security clearances, where necessary, and file with the Secretary a notice of intent to introduce classified information into a hearing at the earliest possible time after the notice of hearing.

(b) If a participant has not filed a notice of intent in accordance with this section, he may introduce classified information only if he gives to the other participants and the Commission prompt written notice of intent and only as permitted by the Commission when it determines that the public interest will not be prejudiced.

(c) The notice of intent shall be unclassified and, to the extent consistent with classification requirements, state:

(1) The subject matter of the classified information, which it is anticipated will be involved;

(2) The highest level of classification of the information (confidential, secret or other);

(3) When it is anticipated that the information would be introduced; and

(4) The relevance and materiality of the information to the hearing issues.

§ 110.124 Rearrangement or suspension of a hearing.

When a participant gives notice of intent to introduce classified information and other participants do not have the required security clearances, subject to § 110.121, the Commission may:

(a) Suspend or rearrange the normal order of the hearing to give other participants an opportunity to obtain the required security clearances with minimum delay in the conduct of the hearing; or

(b) Take such other action as it determines to be in the public interest.

§ 110.125 Unclassified statements required.

(a) It is the obligation of hearing participants to introduce information in unclassified form wherever possible, and to declassify, to the maximum extent feasible, any classified information introduced into the hearing. This obligation rests on each participant whether or not any other participant has the required security clearances.

(b) When classified information is offered for introduction into a hearing:

(1) The participant offering it shall, to the extent consistent with classification requirements, submit to the presiding officer and other participants an unclassified statement describing the substance of the classified information as accurately and completely as possible;

(2) In accordance with procedures agreed upon by the participants or prescribed by the presiding officer, and after notice to all participants and opportunity to be heard on the notice, the presiding officer will determine whether an unclassified statement may be substituted for the classified information in the hearing record without prejudice to the interest of any participant or the public;

(3) If the Commission determines that the unclassified statement (together with such unclassified modifications as it finds are necessary or appropriate to protect the interest of other participants and the public) adequately sets forth information in the classified matter which is relevant and material to the issues in the hearing, it will direct that the classified matter be excluded from the record of the hearing; and

(4) The Commission may postpone any of the procedures in this section until all other evidence has been received. However, a participant shall not postpone service of any unclassified statement required in this section.

§ 110.126 Protection of classified information.

Nothing in this subpart shall relieve any person from safeguarding classified information as required by law and rules, regulations or orders of any Government agency.

Subpart K — Rulemaking

§ 110.130 Initiation of rulemaking.

The Commission may initiate action to amend the regulations in this part on its own initiative or in response to a petition.

§ 110.131 Petition for rulemaking.

(a) A petition for rulemaking should be addressed to the Secretary, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Chief, Docketing and Service Branch.

(b) The petition shall state the basis for the requested amendment.

(c) The petition may request the Commission to suspend all or part of any licensing proceeding under this part pending disposition of the petition.

(d) The Secretary will assign a docket number to the petition, place a copy in the Public Document Room and notice its receipt in the **FEDERAL REGISTER**.

(e) Publication may be limited by order of the Commission to the extent required by section 181 of the Atomic Energy Act.

§ 110.132 Commission action on a petition.

(a) The Commission may grant or deny the petition in whole or in part.

(b) If the petition is granted, a notice of proposed rulemaking or a notice of rulemaking will be published in the **FEDERAL REGISTER**.

(c) If the petition is denied, the petitioner will be informed of the grounds.

(d) Commission action on a petition will normally follow, whenever appropriate, receipt and evaluation of Executive Branch views.

(e) The Commission, in exercising the discretion authorized by section 4(a)(1) of the Administrative Procedure Act (5 U.S.C. 553(a)(1)), will decide what, if any, public rulemaking procedures will be followed.

§ 110.133 Notice of proposed rulemaking.

(a) When the Commission proposes to amend the regulations in this part, it will normally publish a notice of proposed rulemaking in the **FEDERAL REGISTER**.

(b) A notice of proposed rulemaking will include:

(1) The authority for the proposed rule;

(2) The substance and purpose of the proposed rule;

(3) Directions for public participation;

(4) The time and place of any public hearing; and

(5) If a hearing is to be held by other than the Commission, designating of a presiding officer and instructions for the conduct of the hearing.

(c) A notice of proposed rulemaking will be published not less than 15 days before any hearing, unless the Commission for good cause provides otherwise in the notice.

§ 110.134 Public participation.

(a) The Commission may hold an oral hearing on a proposed rule or permit any person to participate in a rulemaking proceeding through the submission of written comments.

(b) When it is in the public interest and is authorized by law, public rulemaking procedures may be omitted and a notice of rulemaking published pursuant to § 110.135.

§ 110.135 Notice of rulemaking.

(a) Upon approval of an amendment, the Commission will publish in the **FEDERAL REGISTER** a notice of rulemaking which includes a statement of its basis and purpose, effective date and, where appropriate, any significant variations from the amendment as proposed in any notice of proposed rulemaking.

(b) The effective date of an amendment will normally be no earlier than 30 days after publication of the notice of rulemaking, unless the Commission for good cause provides otherwise in the notice.

Appendix A — Illustrative List of Nuclear Reactor Equipment Under NRC Export Licensing Authority

Note—A nuclear reactor basically includes the items within or attached directly to the reactor vessel, the equipment which controls the level of power in the core, and the components which normally contain or come in direct contact with or control the primary coolant of the reactor core.

(1) Reactor pressure vessels, i.e., metal vessels, as complete units or major shop-fabricated parts, specially designed or prepared to contain the core of a nuclear reactor and capable of withstanding the operating pressure of the primary coolant.

(2) On-line (e.g., CANDU) reactor fuel charging and discharging machines, i.e., manipulative equipment specially designed for inserting or removing fuel in an operating nuclear reactor.

(3) Complete reactor control rod system, i.e., rods specially designed or prepared for the control of the reaction rate in a nuclear reactor, including the neutron absorbing part and the support or suspension structures therefor;

(4) Reactor primary coolant pumps, i.e., pumps specially designed or prepared for circulating the primary coolant in a nuclear reactor.

(5) Reactor pressure tubes, i.e., tubes specially designed or prepared to contain fuel elements and the primary coolant in a nuclear reactor at an operating pressure in excess of 50 atmospheres.

(6) Zirconium tubes, i.e., zirconium metal and alloys in the form of tubes or assemblies of tubes specially designed or prepared for use in a nuclear reactor.

(7) Reactor internals, e.g., core support structures, control and rod guide tubes, thermal shields, baffles, core grid plates and diffuser plates specially designed or prepared for use in a nuclear reactor.

(8) Reactor control rod drive mechanisms, including detection and measuring equipment to determine flux levels.

➤ (9) Any other components especially designed or prepared for use in a nuclear reactor or in any of the components described in this appendix.

Appendix B — Illustrative List of Gas Centrifuge Enrichment Plant Components Under NRC's Export Licensing Authority

1. *Assemblies and components especially designed or prepared for use in gas centrifuges.*

Note—The gas centrifuge normally consists of a thin-walled cylinder(s) of between 75mm (3 ins.) and 400 mm (16 ins.) diameter contained in a vacuum environment and spun at high peripheral speed (of the order of 300 m/per second and more) with the central axis vertical. In order to achieve high speed, the materials of construction for the rotating rotor assembly, and hence its individual components, have to be manufactured to very close tolerances in order to minimize the unbalance. In contrast to other centrifuges, the gas centrifuge for uranium enrichment is characterized by having within the rotor chamber a rotating disc-shaped baffle(s) and a stationary tube arrangement for feeding and extracting UF₆ gas and featuring at least 3 separate channels of which 2 are connected to scoops extending from the rotor axis towards the periphery of the rotor chamber. Also contained within the vacuum environment are a number of critical items which do not rotate and which, although they are especially designed, are not difficult to fabricate nor are they fabricated out of unique materials. A centrifuge facility, however, requires a large number of these components so that quantities can provide an important indication of end use.

1.1 Rotating Components.

(a) Complete Rotor Assemblies: Thin-walled cylinders, or a number of interconnected thin-walled cylinders, manufactured from one of the high strength-to-density ratio materials described in the Footnote to this Section.

If interconnected, the cylinders are joined together by flexible bellows or rings as described in § 1.1(c). The rotor is fitted with an internal baffle(s) and end caps, as described in § 1.1 (d) and (e), if in final form. However, the complete assembly may be delivered only partly assembled.

(b) Rotor Tubes: Especially designed or prepared thin-walled cylinders with thickness of 12mm (.50 in.) or less, a diameter of between 75mm (3 ins.) and 400mm (16 ins.), and manufactured from one of the high strength-to-density ratio materials described in the Footnote to this Section.

(c) Rings or Bellows: Components especially designed or prepared to give localized support to the rotor tube or to join together a number of rotor tubes. The bellows in a short cylinder of wall thickness 3mm (.125 in.) or less, a diameter of between 75mm (3 ins.) and 400mm (16 ins.), having a convolute, and manufactured from one of the high strength-to-density ratio materials described in the footnote to this section.

(d) Baffles: Disc shaped components of between 75mm (3 ins.) and 400mm (16 ins.) diameter especially designed or prepared to be mounted inside the centrifuge rotor tube, in order to isolate the take-off chamber from the main separation chamber and, in some cases, to assist the UF₆ gas circulation within the main separation chamber of the rotor tube, and manufactured from one of the high strength-to-density ratio materials described in the Footnote to this Section.

(e) Top Caps/Bottom Caps: Disc shaped components of between 75mm (3 ins.) and 400mm (16 ins.) diameter especially designed or prepared to fit to the ends of the rotor tube, and so contain the UF₆ within the rotor tube, and in some cases to support, retain or contain as an integrated part, an element of the upper bearing (top cap) or to carry the rotating elements of the motor and lower bearing (bottom cap), and manufactured from one of the high strength-to-density ratio materials described in the Footnote to this Section.

Footnote

The materials used for centrifuge rotating components are:

(a) Maraging steel capable of an ultimate tensile strength of 2.050×10^8 N/m² (300,000 lb/in.²) or more.

(b) Aluminium alloys capable of an ultimate tensile strength of 0.460×10^8 N/m² (67,000 lb/in.²) or more.

➤ (c) Filamentary materials suitable for use in composite structures and having a specific modulus of 3.18×10^6 m or greater and a specific ultimate tensile strength of 7.62×10^4 m or greater.

("Specific Modulus" is the Young's modulus in N/m² divided by the specific weight in N/m³ when measured at a temperature of 23±20C and a relative humidity of 50±5%.

"Specific tensile strength" is the ultimate tensile strength in N/m² divided by the specific weight in N/m³ when measured at a temperature of 23±20C and a relative humidity of 50±5%.)

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1.2 *Static Components:*
(a) **Magnetic Suspension Bearings:** Especially designed or prepared bearing assemblies consisting of an annular magnet suspended within a housing containing a damping medium. The housing will be manufactured from a UF₆ resistant material (see footnote to section 2). The magnet couples with a pole piece or a second magnet fitted to the top cap described in Section 1.1(e). The magnet may be ring-shaped with a relation between outer and inner diameter smaller or equal to 1.6:1. The magnet may be in a form having an initial permeability of 0.15 Henry/meter (120,000 in CGS units) or more, or a remanence of 98.5 percent or more, or an energy product of greater than 80,000 joules/m³ (10×10⁶ gauss-oersteds.) In addition to the usual material properties, it is a prerequisite that the deviation of the magnetic axes from the geometrical axes is limited to very small tolerances (lower than 0.1mm) or that homogeneity of the material of the magnet is specially called for.

(b) **Bearings/Dampers:** Especially designed or prepared bearings comprising a pivot/cup assembly mounted on a damper. The pivot is normally a hardened steel shaft polished into a hemisphere at one end with a means of attachment to the bottom cap described in Section 1.1(e) at the other. The shaft may, however, have a hydrodynamic bearing attached. The cup is pellet-shaped with hemispherical indentation in one surface. These components are often supplied separately to the damper.
(c) **Molecular Pumps:** Especially designed or prepared cylinders having internally machined or extruded helical grooves and internally machined bores. Typical dimensions are as follows: 7mm (0.3 ins.) to 400mm (16 ins.) internal diameter, 10mm (0.4 ins.) or more wall thickness, 1 to 1 length to diameter ratio. The grooves are typically rectangular in cross-section and 2mm (0.08 in.) or more in depth.
(d) **Motor Stators:** Especially designed or prepared ring shaped stators for high speed multi-phase AC hysteresis (or reluctance) motors for synchronous operation within a vacuum in the frequency range of 600-2000 Hz and a power range of 50-100 volts amps. The stators consist of multi-phase windings on a laminated low loss iron core comprised of thin layers typically 2.0mm (0.08 in.) thick or less.

➤ (e) **Centrifuge housing/recipients:** Components especially designed or prepared to contain the rotor tube assembly of a gas centrifuge. The housing consists of a rigid cylinder of wall thickness up to 30 mm (1.2in) with precision machined ends to locate the bearings and with one or more flanges for mounting. The machined ends are parallel to each other and perpendicular to the cylinder's longitudinal axis to within 0.05 degrees or less. The housing may also be a honeycomb type structure to accommodate several rotor tubes. The housings are made of or protected by materials resistant to corrosion by UF₆.
(f) **Scoops:** Especially designed or prepared tubes of up to 12 mm (0.5in) internal diameter for the extraction of UF₆ gas from within the rotor tube by a Pitot tube action (that is, with an aperture facing into the circumferential gas flow within the rotor tube, for example by bending the end of a radially disposed tube) and capable of being fixed to the central gas extraction system. The tubes are made of or protected by materials resistant to corrosion by UF₆.

2. *Especially designed or prepared auxiliary systems, equipment and components for gas centrifuge enrichment plants.*
Note.—The auxiliary systems, equipment and components for a gas centrifuge enrichment plant are the systems of the plant needed to feed UF₆ to the centrifuges to link the individual centrifuges to each other to form cascades (or stages) to allow for progressively higher enrichments and to extract the product and tails of UF₆ from the centrifuges, together with the equipment required to drive the centrifuges or to control the plant.
Normally UF₆ is evaporated from the solid using heated autoclaves and is distributed in gaseous form to the centrifuges by way of cascade header pipework. The "product" and "tails" of UF₆ gaseous streams flowing from the centrifuges are also passed by way of cascade header pipework to cold traps (operating at about -70 °C where they are condensed prior to onward transfer into suitable containers for transportation or storage. Because an enrichment plant consists of many thousands of centrifuges arranged in cascades, there are many kilometers of cascade header pipework incorporating thousands of welds with a substantial amount of repetition of layout. The equipment, component and piping systems are fabricated to very high vacuum and cleanliness standards.
The following items either come into direct contact with UF₆ process gas or directly control the centrifuge and the passage of the gas from centrifuge to centrifuge and cascade to cascade.

(a) **Feed Systems/Product and Tails Withdrawal Systems:** Especially designed or prepared process systems including:

1. Feed autoclaves (or stations), used for passing UF₆ to the centrifuge cascades at up to 100 kN/m² (15 psi) and at a rate of 1 kg/h or more.
2. Desublimers (or cold traps) used to remove UF₆ from the cascades up to 3 kN/m² (0.5 lb/in²) pressure. The desublimers are capable of being chilled to -70 °C and heated to 70 °C.
3. Product and tails stations used for trapping UF₆ into containers.
This plant equipment and pipework are wholly made of or lined with UF₆ resistant materials (see Footnote to this Section) and are fabricated to very high vacuum and cleanliness standards.
(b) **Machine Header Piping Systems:** Especially designed or prepared piping systems and header systems for handling UF₆ within the centrifuge cascades.
This piping network is normally of the "triple" header system with each centrifuge connected to each of the headers. There is thus a substantial amount of repetition in its form. It is wholly made of UF₆ resistant materials (see Note to this Section) and is fabricated to very high vacuum and cleanliness standards.
(c) **UF₆ Mass Spectrometers/Ion Sources:** Especially designed or prepared magnetic or quadrupole mass spectrometers capable of taking "on-line" sample of feed, product or tails from UF₆ gas streams and having all of the following characteristics:
 1. Unit resolution for mass greater than 320.
 2. Ion sources constructed of or lined with nichrome, monel or nickel-plate.
 3. Electron bombardment ionization sources.
 4. Having a collector system suitable for isotope analysis.
(d) **Frequency Changers:** Frequency changers (also known as converters or invertors) especially designed or prepared to supply motor stators as defined under Section 1.2(d), or parts, components and subassemblies of such frequency changers having all of the following characteristics:
 1. A multiphase output of 600 Hz to 2000Hz.
 2. High stability (with frequency control better than 0.1%).
 3. Low harmonic distortion (less than 2%).
 4. An efficiency of greater than 80%.

Footnote
Materials resistant to corrosion by UF₆ include stainless steel, aluminum, aluminum alloys, nickel or alloys containing 60% or more nickel.

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Appendix C—Illustrative List of Gaseous Diffusion Enrichment Plant Assemblies and Components Under NRC Export Licensing Authority

Note—In the gaseous diffusion method of uranium isotope separation, the main technological assembly is a special porous gaseous diffusion barrier, heat exchanger for cooling the gas (which is heated by the process of compression), seal valves and control valves, and pipelines. Inasmuch as gaseous diffusion technology uses uranium hexafluoride (UF₆), all equipment, pipeline and instrumentation surfaces (that come in contact with the gas) must be made of materials that remain stable in contact with UF₆. A gaseous diffusion facility requires a number of these assemblies, so that quantities can provide an important indication of end use.

The auxiliary systems, equipment and components for gaseous diffusion enrichment plants are the systems of plant needed to feed UF₆ to the gaseous diffusion assembly to link the individual assemblies to each other to form cascades (or stages) to allow for progressively higher enrichments and to extract the "product" and "tails" UF₆ from the diffusion cascades. Because of the high inertial properties of diffusion cascades, any interruption in their operation, and especially their shut-down, leads to serious consequences. Therefore, a strict and constant maintenance of vacuum in all technological systems, automatic protection for accidents, and precise automated regulation of the gas flow is of importance in a gaseous diffusion plant. All this leads to a need to equip the plant with a large number of special measuring, regulating, and controlling systems.

Normally UF₆ is evaporated from cylinders placed within autoclaves and is distributed in gaseous form to the entry point by way of cascade header pipework. The "product" and "tails" UF₆ gaseous streams flowing from exit points are passed by way of cascade header pipework to either cold traps or to compression stations where the UF₆ gas is liquified prior to onward transfer into suitable containers for transportation or storage. Because a gaseous diffusion enrichment plant consists of a large number of gaseous diffusion assemblies arranged in cascades, there are many kilometers of cascade header pipework, incorporating thousands of welds with substantial amounts of repetition of layout. The equipment, components and piping systems are fabricated to very high vacuum and cleanliness standards.

The items listed below either come into direct contact with the UF₆ process gas or directly control the flow within the cascade. All surfaces which come into contact with the process gas are wholly made of, or lined with, UF₆-resistant materials. For the purposes of this appendix the materials resistant to corrosion by UF₆ include stainless steel, aluminum, aluminum alloys, aluminum oxide, nickel or alloys containing 60 percent or more nickel, and UF₆-resistant fully fluorinated hydrocarbon polymers.

1. Assemblies and components especially designed or prepared for use in gaseous diffusion enrichment.

1.1 Gaseous Diffusion Barriers

Especially designed or prepared thin, porous filters, with a pore size of 100–1000 Å (angstroms), a thickness of 5 mm or less, and for tubular forms, a diameter of 25 mm or less, made of metallic, polymer or ceramic materials resistant to corrosion by UF₆, and especially prepared compounds or powders for the manufacture of such filters. Such compounds and powders include nickel or alloys containing 60 percent or more nickel, aluminum oxide, or UF₆-resistant fully fluorinated hydrocarbon polymers having a purity of 99.9 percent or more, a particle size less than 10 microns, and a high degree of particle size uniformity, which are especially prepared for the manufacture of gaseous diffusion barriers.

1.2 Diffuser Housings

Especially designed or prepared hermetically sealed cylindrical vessels greater than 30 cm in diameter and greater than 90 cm in length, or rectangular vessels of comparable dimensions, which have an inlet connection and two outlet connections all of which are greater than 5 cm in diameter, for containing the gaseous diffusion barrier, made of or lined with UF₆-resistant materials and designed for horizontal or vertical installation.

1.3 Compressors and Gas Blowers

Especially designed or prepared axial, centrifugal, or positive displacement compressors, or gas blowers with a suction volume capacity of 1 m³/min or more of UF₆, and with a discharge pressure of up to several hundred kN/m² (100 PSI), designed for long-term operation in the UF₆ environment with or without an electrical motor of appropriate power, as well as separate assemblies of such compressors and gas blowers. These compressors and gas blowers have a pressure ratio between 2/1 and 6/1 and are made of, or lined with, materials resistant to UF₆.

1.4 Rotary Shaft Seals

Especially designed or prepared vacuum seals, with seal feed and seal exhaust connections, for sealing the shaft connecting the compressor or the gas blower rotor with the driver motor so as to ensure a reliable seal against in-leaking of air into the inner chamber of the compressor or gas blower which is filled with UF₆. Such seals are normally designed for a buffer gas in-leakage rate of less than 1000 cm³/min.

1.5 Heat Exchangers for Cooling UF₆

Especially designed or prepared heat exchangers made of or lined with UF₆-resistant materials (except stainless steel) or with copper or any combination of those metals, and intended for a leakage pressure change rate of less than 10 N/m² (0.0015 PSI) per hour under a pressure difference of 100 kN/m² (15 PSI).

2. Auxiliary systems, equipment and components especially designed or prepared for use in gaseous diffusion enrichment.

2.1 Feed Systems/Product and Tails Withdrawal Systems

Especially designed or prepared process systems, capable of operating at pressures of 300 kN/m² (45 PSI) or less, including:

1. Feed autoclaves (or systems), used for passing UF₆ to the gaseous diffusion cascades;
2. Desublimers (or cold traps) used to remove UF₆ from diffusion cascades;
3. Liquefaction stations where UF₆ gas from the cascade is compressed and cooled to form liquid UF₆;
4. "Product" or "tails" stations used for transferring UF₆ into containers.

2.2 Header Piping Systems

Especially designed or prepared piping systems and header systems for handling UF₆ within the gaseous diffusion cascades. This piping network is normally of the "double" header system with each cell connected to each of the headers.

2.3 Vacuum Systems

(a) Especially designed or prepared large vacuum manifolds, vacuum headers and vacuum pumps having a suction capacity of 5 m³/min or more.

(b) Vacuum pumps especially designed for service in UF₆-bearing atmospheres made of, or lined with, aluminum, nickel, or alloys bearing more than 60 percent nickel. These pumps may be either rotary or positive displacement, may have fluorocarbon seals, and may have special working fluids present.

2.4 Special Shut-Off and Control Valves

Especially designed or prepared manual or automated shut-off and control bellows valves made of UF₆-resistant materials with a diameter of 4 cm to 1.5 m for installation in main and auxiliary systems of gaseous diffusion enrichment plants.

2.5 UF₆ Mass Spectrometers/Ion Sources

Especially designed or prepared magnetic or quadrupole mass spectrometers capable of taking "on-line" samples of feed, product or tails, from UF₆ gas streams and having all of the following characteristics:

- (a) unit resolution for mass greater than 320;
- (b) ion sources constructed of or lined with nichrome or monel or nickel plated;
- (c) electron bombardment ionization sources;
- (d) having a collector system suitable for isotopic analysis.

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Appendix D to Part 110—Illustrative List of Aerodynamic Enrichment Plant Equipment and Components Under NRC Export Licensing Authority

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 ➤ **Note**—In aerodynamic enrichment processes, a mixture of gaseous UF₆ and light gas (hydrogen or helium) is compressed and then passed through separating elements wherein isotopic separation is accomplished by the generation of high centrifugal forces over a curved-wall geometry. Two processes of this type have been successfully developed: the separation nozzle process and

the vortex tube process. For both processes the main components of a separation stage included cylindrical vessels housing the special separation elements (nozzles or vortex tubes), gas compressors and heat exchangers to remove the heat of compression. An aerodynamic plant requires a number of these stages, so that quantities can provide an important indication of end use. Because aerodynamic processes use UF₆, all equipment, pipeline and instrumentation surfaces (that come in contact with the gas) must be made of materials that remain stable in contact with UF₆. All surfaces which come into contact with the process gas are made of or protected by UF₆-resistant materials; including copper, stainless steel, aluminum, aluminum alloys, nickel or alloys containing 60% or more nickel and UF₆-resistant fully fluorinated hydrocarbon polymers.

The following items either come into direct contact with the UF₆ process gas or directly control the flow within the cascade:

(1) Separation nozzles and assemblies.

Especially designed or prepared nozzles that consist of slit-shaped, curved channels having a radius of curvature less than 1 mm (typically 0.1 to 0.05 mm). The nozzles are resistant to UF₆ corrosion and have a knife-edge within the nozzle that separates the gas flowing through the nozzle into two fractions.

(2) Vortex tubes and assemblies.

Especially designed or prepared vortex tubes that are cylindrical or tapered, made of or protected by materials resistant to UF₆ corrosion, have a diameter of between 0.5 cm and 4 cm, a length to diameter ratio of 20:1 or less and with one or more tangential inlets. The tubes may be equipped with nozzle-type appendages at either or both ends.

The feed gas enters the vortex tube tangentially at one end or through swirl vanes or at numerous tangential positions along the periphery of the tube.

(3) Compressors and gas blowers.

Especially designed or prepared axial, centrifugal, or positive displacement compressors or gas blowers made of or protected by materials resistant to UF₆ corrosion and with a suction volume capacity of 2 m³/min or more of UF₆/carrier gas (hydrogen or helium) mixture. These compressors and gas blowers typically have a pressure ratio between 1.2:1 and 6:1.

(4) Rotary shaft seals.

Especially designed or prepared seals, with seal feed and seal exhaust connections, for sealing the shaft connecting the compressor rotor or the gas blower rotor with the driver motor to ensure a reliable seal against out-leakage of process gas or in-leakage of air or seal gas into the inner chamber of the compressor or gas blower which is filled with a UF₆/carrier gas mixture.

(5) Heat exchangers for gas cooling.

Especially designed or prepared heat exchangers, made of or protected by materials resistant to UF₆ corrosion.

(6) Separation element housings.

Especially designed or prepared separation element housings, made of or protected by materials resistant to UF₆ corrosion, for containing vortex tubes or separation nozzles.

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These housings may be cylindrical vessels greater than 300 mm in diameter and greater than 900 mm in length, or may be rectangular vessels of comparable dimensions, and may be designed for horizontal or vertical installation.

(7) Feed systems/product and tails withdrawal systems.

Especially designed or prepared process systems or equipment for enrichment plants made of or protected by materials resistant to UF₆ corrosion, including:

(i) Feed autoclaves, ovens, or systems used for passing UF₆ to the enrichment process;

(ii) Desublimers (or cold traps) used to remove UF₆ from the enrichment process for subsequent transfer upon heating;

(iii) Solidification or liquefaction stations used to remove UF₆ from the enrichment process by compressing and converting UF₆ to a liquid or solid form; and

(iv) "Product" or "tails" stations used for transferring UF₆ into containers.

(8) Header piping systems.

Especially designed or prepared header piping systems, made of or protected by materials resistant to UF₆ corrosion, for handling UF₆ within the aerodynamic cascades.

The piping network is normally of the "double" header design with each stage or group of stages connected to each of the headers.

(9) Vacuum systems and pumps.

Especially designed or prepared vacuum systems having a suction capacity of 5 m³/min or more, consisting of vacuum manifolds, vacuum headers and vacuum pumps, and designed for service in UF₆-bearing atmospheres.

Especially designed or prepared vacuum pumps for service in UF₆-bearing atmospheres and made of or protected by materials resistant to UF₆ corrosion. These pumps may use fluorocarbon seals and special working fluids.

(10) Special shut-off and control valves.

Especially designed or prepared manual or automated shut-off and control bellows valves made of or protected by materials resistant to UF₆ corrosion with a diameter of 40 to 1500 mm for installation in main and auxiliary systems of aerodynamic enrichment plants.

(11) UF₆ mass spectrometers/ion sources.

Especially designed or prepared magnetic or quadrupole mass spectrometers capable of taking "on-line" samples of feed, "product" or "tails", from UF₆ gas streams and having all of the following characteristics:

(i) Unit resolution for mass greater than 320;

(ii) Ion sources constructed of or lined with nichrome or monel or nickel plated;

(iii) Electron bombardment ionization sources; and

(iv) Collector system suitable for isotopic analysis.

(12) UF₆/carrier gas separation systems.

Especially designed or prepared process systems for separating UF₆ from carrier gas (hydrogen or helium).

These systems are designed to reduce the UF₆ content in the carrier gas to 1 ppm or less and may incorporate equipment such as:

(i) Cryogenic heat exchangers and cryoseparators capable of temperatures of -120°C or less;

(ii) Cryogenic refrigeration units capable of temperatures of -120°C or less;

(iii) Separation nozzle or vortex tube units for the separation of UF₆ from carrier gas; or

(iv) UF₆ cold traps capable of temperatures of -20°C or less.

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Appendix E to Part 110—Illustrative List of Chemical Exchange or Ion Exchange Enrichment Plant Equipment and Components Under NRC Export Licensing Authority

Note—The slight difference in mass between the isotopes of uranium causes small changes in chemical reaction equilibria that can be used as a basis for separation of the isotopes. Two processes have been successfully developed: liquid-liquid chemical exchange and solid-liquid ion exchange.

A. In the liquid-liquid chemical exchange process, immiscible liquid phases (aqueous and organic) are countercurrently contacted to give the cascading effect of thousands of separation stages. The aqueous phase consists of uranium chloride in hydrochloric acid solution; the organic phase consists of an extractant containing uranium chloride in an organic solvent. The contactors employed in the separation cascade can be liquid-liquid exchange columns (such as pulsed columns with sieve plates) or liquid centrifugal contactors. Chemical conversions (oxidation and reduction) are required at both ends of the separation cascade in order to provide for the reflux requirements at each end. A major design concern is to avoid contamination of the process streams with certain metal ions. Plastic, plastic-lined (including use of fluorocarbon polymers) and/or glass-lined columns and piping are therefore used.

(1) Liquid-liquid exchange columns.

Countercurrent liquid-liquid exchange columns having mechanical power input (i.e., pulsed columns with sieve plates, reciprocating plate columns, and columns with internal turbine mixers), especially designed or prepared for uranium enrichment using the chemical exchange process. For corrosion resistance to concentrated hydrochloric acid solutions, these columns and their internals are made of or protected by suitable plastic materials (such as fluorocarbon polymers) or glass. The stage residence time of the columns is designed to be short (30 seconds or less).

(2) Liquid-liquid centrifugal contactors.

Especially designed or prepared for uranium enrichment using the chemical exchange process. These contactors use rotation to achieve dispersion of the organic and aqueous streams and then centrifugal force to separate the phases. For corrosion resistance to concentrated hydrochloric acid solutions, the contactors are made of or are lined with suitable plastic materials (such as fluorocarbon polymers) or are lined with glass. The stage residence time of the centrifugal contactors is designed to be short (30 seconds or less).

(3) Uranium reduction systems and equipment.

(i) Especially designed or prepared electrochemical reduction cells to reduce uranium from one valence state to another for uranium enrichment using the chemical exchange process. The cell materials in contact with process solutions must be corrosion resistant to concentrated hydrochloric acid solutions.

The cell cathodic compartment must be designed to prevent re-oxidation of uranium to its higher valence state. To keep the uranium in the cathodic compartment, the cell may have an impervious diaphragm membrane constructed of special cation exchange material. The cathode consists of a suitable solid conductor such as graphite.

These systems consist of solvent extraction equipment for stripping the U+4 from the organic stream into an aqueous solution, evaporation and/or other equipment to accomplish solution pH adjustment and control, and pumps or other transfer devices for feeding to the electrochemical reduction cells. A major design concern is to avoid contamination of the aqueous stream with certain metal ions. For those parts in contact with the process stream, the system is constructed of equipment made of or protected by materials such as glass, fluorocarbon polymers, polyphenyl sulfate, polyether sulfone, and resin-impregnated graphite.

(ii) Especially designed or prepared systems at the product end of the cascade for taking the U+4 out of the organic stream, adjusting the acid concentration and feeding to the electrochemical reduction cells.

These systems consist of solvent extraction equipment for stripping the U+4 from the organic stream into an aqueous solution, evaporation and/or other equipment to accomplish solution pH adjustment and control, and pumps or other transfer devices for feeding to the electrochemical reduction cells. A major design concern is to avoid contamination of the aqueous stream with certain metal ions. For those parts in contact with the process stream, the system is constructed of equipment made of or protected by materials such as glass, fluorocarbon polymers, polyphenyl sulfate, polyether sulfone, and resin-impregnated graphite.

(4) Feed preparation systems.

Especially designed or prepared systems for producing high-purity uranium chloride feed solutions for chemical exchange uranium isotope separation plants.

These systems consist of dissolution, solvent extraction and/or ion exchange equipment for purification and electrolytic cells for reducing the uranium U+6 or U+4 to U+3. These systems produce uranium chloride solutions having only a few parts per million of metallic impurities such as chromium, iron, vanadium, molybdenum and other bivalent or higher multi-valent cations. Materials of construction for portions of the system processing high-purity U+3 include glass, fluorocarbon polymers, polyphenyl sulfate or polyether sulfone plastic-lined and resin-impregnated graphite.

(5) Uranium oxidation systems.

Especially designed or prepared systems for oxidation of U+3 to U+4 for return to the

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uranium isotope separation cascade in the chemical exchange enrichment process.

These systems may incorporate equipment such as:

(i) Equipment for contacting chlorine and oxygen with the aqueous effluent from the isotope separation equipment and extracting the resultant U+4 into the stripped organic stream returning from the product end of the cascade; and

(ii) Equipment that separates water from hydrochloric acid so that the water and the concentrated hydrochloric acid may be reintroduced to the process at the proper locations.

B. In the solid-liquid ion-exchange process, enrichment is accomplished by uranium adsorption/desorption on a special, fast-acting, ion-exchange resin or adsorbent. A solution of uranium in hydrochloric acid and other chemical agents is passed through cylindrical enrichment columns containing packed beds of the adsorbent. For a continuous process, a reflux system is necessary to release the uranium from the adsorbent back in the liquid flow so that "product" and "tails" can be collected. This is accomplished with the use of suitable reduction/oxidation chemical agents that are fully regenerated in separate circuits and that may be partially regenerated within the isotopic separation columns themselves. The presence of hot concentrated hydrochloric acid solutions in the process requires that the equipment be made of or protected by special corrosion-resistant materials.

(1) Fast reacting ion exchange resins/adsorbents.

Especially designed or prepared for uranium enrichment using the ion exchange process, including porous macroporous resins, and/or pellicular structures in which the active chemical exchange groups are limited to a coating on the surface of an inactive porous support structure, and other composite structures in any suitable form including particles or fibers. These ion exchange resins/adsorbents have diameters of 0.2 mm or less and must be chemically resistant to concentrated hydrochloric acid solutions as well as physically strong enough so as not to degrade in the exchange columns. The resins/adsorbents are especially designed to achieve very fast uranium isotope exchange kinetics (exchange rate half-time of less than 10 seconds) and are capable of operating at a temperature in the range of 100°C to 200°C.

(2) Ion exchange columns.

Cylindrical columns greater than 1000 mm in diameter for containing and supporting packed beds of ion exchange resin/adsorbent, especially designed or prepared for uranium enrichment using the ion exchange process. These columns are made of or protected by materials (such as titanium or fluorocarbon plastics) resistant to corrosion by concentrated hydrochloric acid solutions and are capable of operating at a temperature in the range of 100°C to 200°C and pressures above 0.7 MPa (102 psia).

(3) Ion exchange reflux systems.

(i) Especially designed or prepared chemical or electrochemical reduction systems for regeneration of the chemical

reducing agent(s) used in ion exchange uranium enrichment cascades.

The ion exchange enrichment process may use, for example, trivalent titanium (Ti+3) as a reducing cation in which case the reduction system would regenerate Ti+3 by reducing Ti+4.

(ii) Especially designed or prepared chemical or electrochemical oxidation systems for regeneration of the chemical oxidizing agent(s) used in ion exchange uranium enrichment cascades.

The ion exchange enrichment process may use, for example, trivalent iron (Fe+3) as an oxidant in which case the oxidation system would regenerate Fe+3 by oxidizing Fe+2.

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Appendix F to Part 110—Illustrative List of Laser-Based Enrichment Plant Equipment and Components Under NRC Export Licensing Authority

Note—Present systems for enrichment processes using lasers fall into two categories: the process medium is atomic uranium vapor and the process medium is the vapor of a uranium compound. Common nomenclature for these processes include: first category-atomic vapor laser isotope separation (AVLIS or SILVA); second category-molecular laser isotope separation (MLIS or MOLIS) and chemical reaction by isotope selective laser activation (CRISLA). The systems, equipment and components for laser enrichment plants include: (a) Devices to feed uranium-metal vapor for selective photo-ionization or devices to feed the vapor of a uranium compound for photo-dissociation or chemical activation; (b) devices to collect enriched and depleted uranium metal as "product" and "tails" in the first category, and devices to collect dissociated or reacted compounds as "product" and unaffected material as 'tails' in the second category; (c) process laser systems to selectively excite the uranium-235 species; and (d) feed preparation and product conversion equipment. The complexity of the spectroscopy of uranium atoms and compounds may require incorporation of a number of available laser technologies.

All surfaces that come into contact with the uranium or UF₆ are wholly made of or protected by corrosion-resistant materials. For laser-based enrichment items, the materials resistant to corrosion by the vapor or liquid of uranium metal or uranium alloys include yttria-coated graphite and tantalum; and the materials resistant to corrosion by UF₆ include copper, stainless steel, aluminum, aluminum alloys, nickel or alloys containing 60% or more nickel and UF₆-resistant fully fluorinated hydrocarbon polymers.

Many of the following items come into direct contact with uranium metal vapor or liquid or with process gas consisting of UF₆ or a mixture of UF₆ and other gases:

(1) Uranium vaporization systems (AVLIS).

Especially designed or prepared uranium vaporization systems that contain high-power strip or scanning electron beam guns with a delivered power on the target of more than 2.5 kW/cm.

(2) Liquid uranium metal handling systems (AVLIS).

Especially designed or prepared liquid metal handling systems for molten uranium or uranium alloys, consisting of crucibles and cooling equipment for the crucibles.

The crucibles and other system parts that come into contact with molten uranium or uranium alloys are made of or protected by materials of suitable corrosion and heat resistance, such as tantalum, yttria-coated graphite, graphite coated with other rare earth oxides or mixtures thereof.

(3) Uranium metal "product" and "tails" collector assemblies (AVLIS).

Especially designed or prepared "product" and "tails" collector assemblies for uranium metal in liquid or solid form.

Components for these assemblies are made of or protected by materials resistant to the heat and corrosion of uranium metal vapor or liquid, such as yttria-coated graphite or tantalum, and may include pipes, valves, fittings, "gutters", feed-throughs, heat exchangers and collector plates for magnetic, electrostatic or other separation methods.

(4) Separator module housings (AVLIS).

Especially designed or prepared cylindrical or rectangular vessels for containing the uranium metal vapor source, the electron beam gun, and the "product" and "tails" collectors.

These housings have multiplicity of ports for electrical and water feed-throughs, laser beam windows, vacuum pump connections and instrumentation diagnostics and monitoring with opening and closure provisions to allow refurbishment of internal components.

(5) Supersonic expansion nozzles (MLIS).

Especially designed or prepared supersonic expansion nozzles for cooling mixtures of UF₆ and carrier gas to 150 K or less which are corrosion resistant to UF₆.

(6) Uranium pentafluoride product collectors (MLIS).

Especially designed or prepared uranium pentafluoride (UF₅) solid product collectors consisting of filter, impact, or cyclone-type collectors, or combinations thereof, which are corrosion resistant to the UF₅/UF₆ environment.

(7) UF₆/carrier gas compressors (MLIS).

Especially designed or prepared compressors for UF₆/carrier gas mixtures, designed for long term operation in a UF₆ environment. Components of these compressors that come into contact with process gas are made of or protected by materials resistant to UF₆ corrosion.

(8) Rotary shaft seals (MLIS).

Especially designed or prepared rotary shaft seals, with seal feed and seal exhaust connections, for sealing the shaft connecting the compressor rotor with the driver motor to ensure a reliable seal against out-leakage of process gas or in-leakage of air or seal gas into the inner chamber of the compressor which is filled with a UF₆/carrier gas mixture.

(9) Fluorination systems (MLIS).

Especially designed or prepared systems for fluorinating UF₅ (solid) to UF₆ (gas).

These systems are designed to fluorinate the collected UF₅ powder to UF₆ for subsequent collection in product containers

or for transfer as feed to MLIS units for additional enrichment. In one approach, the fluorination reaction may be accomplished within the isotope separation system to react and recover directly off the "product" collectors. In another approach, the UF₅ powder may be removed/transferred from the "product" collectors into a suitable reaction vessel (e.g., fluidized-bed reactor, screw reactor or flame tower) for fluorination. In both approaches equipment is used for storage and transfer of fluorine (or other suitable fluorinating agents) and for collection and transfer of UF₆.

(10) UF₆ mass spectrometers/ion sources (MLIS).

Especially designed or prepared magnetic or quadrupole mass spectrometers capable of taking "on-line" samples of feed, "product" or "tails", from UF₆ gas streams and having all of the following characteristics:

- (i) Unit resolution for mass greater than 320;
- (ii) Ion sources constructed of or lined with nichrome or monel or nickel plated;
- (iii) Electron bombardment ionization sources; and
- (iv) Collector system suitable for isotopic analysis.

(11) Feed systems/product and tails withdrawal systems (MLIS).

Especially designed or prepared process systems or equipment for enrichment plants made of or protected by materials resistant to corrosion by UF₆, including:

- (i) Feed autoclaves, ovens, or systems used for passing UF₆ to the enrichment process;
- (ii) Desublimers (or cold traps) used to remove UF₆ from the enrichment process for subsequent transfer upon heating;
- (iii) Solidification or liquefaction stations used to remove UF₆ from the enrichment process by compressing and converting UF₆ to a liquid or solid; and
- (iv) "Product" or "tails" stations used to transfer UF₆ into containers.

(12) UF₆/carrier gas separation systems (MLIS).

Especially designed or prepared process systems for separating UF₆ from carrier gas. The carrier gas may be nitrogen, argon, or other gas.

These systems may incorporate equipment such as:

- (i) Cryogenic heat exchangers or cryoseparators capable of temperatures of -120°C or less;
- (ii) Cryogenic refrigeration units capable of temperatures of -120°C or less; or
- (iii) UF₆ cold traps capable of temperatures of -20°C or less.

(13) Lasers or Laser systems (AVLIS, MLIS and CRISLA).

Especially designed or prepared for the separation of uranium isotopes. The laser system for the AVLIS process usually consists of two lasers: a copper vapor laser and a dye laser. The laser system for MLIS usually consists of a CO₂ or excimer laser and a multi-pass optical cell with revolving mirrors at both ends. Lasers or laser systems for both processes require a spectrum frequency stabilizer for operation over extended periods.

Appendix G to Part 110—Illustrative List of Plasma Separation Enrichment Plant Equipment and Components Under NRC Export Licensing Authority

Note—In the plasma separation process, a plasma of uranium ions passes through an electric field tuned to the 235U ion resonance frequency so that they preferentially absorb energy and increase the diameter of their corkscrew-like orbits. Ions with a large-diameter path are trapped to produce a product enriched in 235U. The plasma, made by ionizing uranium vapor, is contained in a vacuum chamber with a high-strength magnetic field produced by a superconducting magnet. The main technological systems of the process include the uranium plasma generation system, the separator module with superconducting magnet, and metal removal systems for the collection of "product" and "tails".

(1) Microwave power sources and antennae.

Especially designed or prepared microwave power sources and antennae for producing or accelerating ions having the following characteristics: greater than 30 GHz frequency and greater than 50 kW mean power output for ion production.

(2) Ion excitation coils.

Especially designed or prepared radio frequency ion excitation coils for frequencies of more than 100 kHz and capable of handling more than 40 kW mean power.

(3) Uranium plasma generation systems.

Especially designed or prepared systems for the generation of uranium plasma, which may contain high power strip or scanning electron beam guns with a delivered power on the target of more than 2.5 kW/cm.

(4) Liquid uranium metal handling systems.

Especially designed or prepared liquid metal handling systems for molten uranium or uranium alloys, consisting of crucible and cooling equipment for the crucibles.

The crucibles and other system parts that come into contact with molten uranium or uranium alloys are made of or protected by corrosion and heat resistance materials, such as tantalum, yttria-coated graphite, graphite coated with other rare earth oxides or mixtures thereof.

(5) Uranium metal "product" and "tails" collector assemblies.

Especially designed or prepared "product" and "tails" collector assemblies for uranium metal in solid form. These collector assemblies are made of or protected by materials resistant to the heat and corrosion of uranium metal vapor, such as yttria-coated graphite or tantalum.

(6) Separator module housings.

Especially designed or prepared cylindrical vessels for use in plasma separation enrichment plants for containing the uranium plasma source, radio-frequency drive coil and the "product" and "tails" collectors.

These housings have a multiplicity of ports for electrical feed-throughs, diffusion pump connections and instrumentation diagnostics and monitoring. They have provisions for opening and closure to allow for refurbishment of internal components and are constructed of a suitable non-magnetic material such as stainless steel.

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Appendix H to Part 110—Illustrative List of Electromagnetic Enrichment Plant Equipment and Components Under NRC Export Licensing Authority

Note—In the electromagnetic process, uranium metal ions produced by ionization of a salt feed material (typically UCL₄) are accelerated and passed through a magnetic field that has the effect of causing the ions of different isotopes to follow different paths. The major components of an electromagnetic isotope separator include: a magnetic field for ion-beam diversion/separation of the isotopes, an ion source with its acceleration system, and a collection system for the separated ions. Auxiliary systems for the process include the magnet power supply system, the ion source high-voltage power supply system, the vacuum system, and extensive chemical handling systems for recovery of product and cleaning/recycling of components.

(1) Electromagnetic isotope separators.

Especially designed or prepared for the separation of uranium isotopes, and equipment and components therefor, including:

(i) Ion Sources—especially designed or prepared single or multiple uranium ion sources consisting of a vapor source, ionizer, and beam accelerator, constructed of materials such as graphite, stainless steel, or copper, and capable of providing a total ion beam current of 50 mA or greater;

(ii) Ion collectors—collector plates consisting of two or more slits and pockets especially designed or prepared for collection of enriched and depleted uranium ion beams and constructed of materials such as graphite or stainless steel;

(iii) Vacuum housings—especially designed or prepared vacuum housings for uranium electromagnetic separators, constructed of suitable non-magnetic materials such as stainless steel and designed for operation at pressures of 0.1 Pa or lower.

The housings are specially designed to contain the ion sources, collector plates and water-cooled liners and have provision for diffusion pump connections and opening and closure for removal and reinstallation of these components; and

(iv) Magnet pole pieces—especially designed or prepared magnet pole pieces having a diameter greater than 2 m used to maintain a constant magnetic field within an electromagnetic isotope separator and to transfer the magnetic field between adjoining separators.

(2) High voltage power supplies.

Especially designed or prepared high-voltage power supplies for ion sources, having all of the following characteristics:

(i) Capable of continuous operation;

(ii) Output voltage of 20,000 V or greater;

(iii) Output current of 1 A or greater; and

(iv) Voltage regulation of better than 0.01% over an 8 hour time period.

(3) Magnet power supplies.

Especially designed or prepared high-power, direct current magnet power supplies having all of the following characteristics:

(i) Capable of continuously producing a current output of 500 A or greater at a voltage of 100 V or greater; and

(ii) A current or voltage regulation better than 0.01% over an 8 hour time period.

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Appendix I to Part 110 — Illustrative List of Reprocessing Plant Components Under NRC Export Licensing Authority

Note—Reprocessing irradiated nuclear fuel separates plutonium and uranium from intensely radioactive fission products and other transuranic elements. Different technical processes can accomplish this separation. However, over the years Purex has become the most commonly used and accepted process. Purex involves the dissolution of irradiated nuclear fuel in nitric acid, followed by separation of the uranium, plutonium, and fission products by solvent extraction using a mixture of tributyl phosphate in an organic diluent.

Purex facilities have process functions similar to each other, including: irradiated fuel element chopping, fuel dissolution, solvent extraction, and process liquor storage. There may also be equipment for thermal denitration of uranium nitrate, conversion of plutonium nitrate to oxide metal, and treatment of fission product waste liquor to a form suitable for long term storage or disposal. However, the specific type and configuration of the equipment performing these functions may differ between Purex facilities for several reasons, including the type and quantity of irradiated nuclear fuel to be reprocessed and the intended disposition of the recovered materials, and the safety and maintenance philosophy incorporated into the design of the facility. A plant of the reprocessing of irradiated fuel elements, includes the equipment and components which normally come in direct contact with and directly control the irradiated fuel and the major nuclear material and fission product processing streams.

(1) Fuel element chopping machines, i.e., remotely operated equipment specially designed or prepared to cut, chop, or shear irradiated nuclear reactor fuel assemblies, bundles, or rods.

(2) Critically safe tanks, i.e., small diameter, annular or slab tanks specially designed or prepared for the dissolution of irradiated nuclear reactor fuel.

(3) Solvent extraction equipment.

Especially designed or prepared solvent extractors such as packed or pulse columns, mixer settlers or centrifugal contactors for use in a plant for the reprocessing of irradiated fuel. Because solvent extractors must be resistant to the corrosive effect of nitric acid, they are normally fabricated to extremely high standards (including special welding and inspection and quality assurance and quality control techniques) out of low carbon stainless steels, titanium, zirconium or other high quality materials.

(4) Chemical holding or storage vessels.

Especially designed or prepared holding or storage vessels for use in a plant for the reprocessing of irradiated fuel. Because holding or storage vessels must be resistant to the corrosive effect of nitric acid, they are normally fabricated of materials such as low carbon stainless steels, titanium or zirconium, or other high quality materials. Holding or storage vessels may be designed for remote operation and maintenance and may have the following features for control of nuclear criticality:

- (i) Walls or internal structures with a boron equivalent of at least 2 percent, or
- (ii) A maximum diameter of 7 inches (17.78 cm) for cylindrical vessels, or
- (iii) A maximum width of 3 inches (7.62 cm) for either a slab or annular vessel.

(5) Plutonium nitrate to plutonium oxide conversion systems. Complete systems especially designed or prepared for the conversion of plutonium nitrate to plutonium oxide, in particular adapted so as to avoid criticality and radiation effects and to minimize toxicity hazards.

(6) Plutonium metal production systems. Complete systems especially designed or prepared for the production of plutonium metal, in particular adapted so as to avoid criticality and radiation effects and to minimize toxicity hazards.

(7) Process control instrumentation specially designed or prepared for monitoring or controlling the processing of material in a reprocessing plant.

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Appendix J to Part 110—Illustrative List of Uranium Conversion Plant Equipment Under NRC Export Licensing Authority

Note—Uranium conversion plants and systems may perform one or more transformations from one uranium chemical species to another, including: conversion of uranium ore concentrates to UO₃, conversion of UO₃ to UO₂, conversion of uranium oxides to UF₄ or UF₆, conversion of UF₄ to UF₆, conversion of UF₆ to UF₄, conversion of UF₄ to uranium metal, and conversion of uranium fluorides to UO₂. Many key equipment items for uranium conversion plants are common to several segments of the chemical process industry, including furnaces, rotary kilns, fluidized bed reactors, flame tower reactors, liquid centrifuges, distillation columns and liquid-liquid extraction columns. However, few of the items are available "off-the-shelf"; most would be prepared according to customer requirements and specifications. Some require special design and construction considerations to address the corrosive properties of the chemicals handled (HF, F₂, ClF₃, and uranium fluorides). In all of the uranium conversion processes, equipment which individually is not especially designed or prepared for uranium conversion can be assembled into systems which are especially designed or prepared for uranium conversion.

(1) Especially designed or prepared systems for the conversion of uranium ore concentrates to UO₃.

Conversion of uranium ore concentrates to UO₃ can be performed by first dissolving the ore in nitric acid and extracting purified uranyl nitrate using a solvent such as tributyl phosphate. Next, the uranyl nitrate is converted to UO₃ either by concentration and denitration or by neutralization with gaseous ammonia to produce ammonium diuranate with subsequent filtering, drying, and calcining.

(2) Especially designed or prepared systems for the conversion of UO₃ to UF₆.

Conversion of UO₃ to UF₆ can be performed directly by fluorination. The process requires a source of fluorine gas or chlorine trifluoride.

(3) Especially Designed or Prepared Systems for the conversion of UO₃ to UO₂.

Conversion of UO₃ to UO₂ can be performed through reduction of UO₃ with cracked ammonia gas or hydrogen.

(4) Especially Designed or Prepared Systems for the conversion of UO₂ to UF₄.

Conversion of UO₂ to UF₄ can be performed by reacting UO₂ with hydrogen fluoride gas (HF) at 300–500°C.

(5) Especially Designed or Prepared Systems for the conversion of UF₄ to UF₆.

Conversion of UF₄ to UF₆ is performed by exothermic reaction with fluorine in a tower reactor. UF₆ is condensed from the hot effluent gases by passing the effluent stream through a cold trap cooled to -10°C. The process requires a source of fluorine gas.

(6) Especially Designed or Prepared Systems for the conversion of UF₄ to U metal.

Conversion of UF₄ to U metal is performed by reduction with magnesium (large batches) or calcium (small batches). The reaction is carried out at temperatures above the melting point of uranium (1130°C).

(7) Especially designed or prepared systems for the conversion of UF₆ to UO₂.

Conversion of UF₆ to UO₂ can be performed by one of three processes. In the first, UF₆ is reduced and hydrolyzed to UO₂ using hydrogen and steam. In the second, UF₆ is hydrolyzed by solution in water, ammonia is added to precipitate ammonium diuranate, and the diuranate is reduced to UO₂ with hydrogen at 820°C. In the third process, gaseous UF₆, CO₂, and NH₃ are combined in water, precipitating ammonium uranyl carbonate. The ammonium uranyl carbonate is combined with steam and hydrogen at 500–600°C to yield UO₂. UF₆ to UO₂ conversion is often performed as the first stage of a fuel fabrication plant.

(8) Especially Designed or Prepared Systems for the conversion of UF₆ to UF₄. Conversion of UF₆ to UF₄ is performed by reduction with hydrogen.

Appendix K to Part 110 — Illustrative List of Equipment and Components Under NRC Export Licensing Authority for Use in a Plant for the Production of Heavy Water, Deuterium and Deuterium Compounds

Note: Heavy water can be produced by a variety of processes. However, two processes have proven to be commercially viable: the water-hydrogen sulphide exchange process (GS process) and the ammonia-hydrogen exchange process.

A. The water-hydrogen sulphide exchange process (GS process) is based upon the exchange of hydrogen and deuterium between water and hydrogen sulphide within a series of towers which are operated with the top section cold and the bottom section hot. Water flows down the towers while the hydrogen sulphide gas circulates from the bottom to the top of the towers. A series of perforated trays are used to promote mixing between the gas and the water. Deuterium migrates to the water at low temperatures and to the hydrogen sulphide at high temperatures. Gas or water, enriched in deuterium, is removed from the first stage towers at the junction of the hot and cold sections and the process is repeated in subsequent stage towers. The product of the last stage, water enriched up to 30 percent in deuterium, is sent to a distillation unit to produce reactor grade heavy water; i.e., 99.75 percent deuterium oxide.

B. The ammonia-hydrogen exchange process can extract deuterium from synthesis gas through contact with liquid ammonia in the presence of a catalyst. The synthesis gas is fed into exchange towers and then to an ammonia converter. Inside the towers the gas flows from the bottom to the top while the liquid ammonia flows from the top to the bottom. The deuterium is stripped from the hydrogen in the synthesis gas and concentrated in the ammonia. The ammonia then flows into an ammonia cracker at the bottom of the tower while the gas flows into an ammonia converter at the top. Further enrichment takes place in subsequent stages and reactor-grade heavy water is produced through final distillation. The synthesis gas feed can be provided by an ammonia plant that can be constructed in association with a heavy water ammonia-hydrogen exchange plant. The ammonia-hydrogen exchange process can also use ordinary water as a feed source of deuterium.

PART 110 • EXPORT AND IMPORT OF NUCLEAR EQUIPMENT AND MATERIAL

C.1. Much of the key equipment for heavy water production plants using either the water-hydrogen sulphide exchange process (GS process) or the ammonia-hydrogen exchange process are common to several segments of the chemical and petroleum industries; particularly in small plants using the GS process. However, few items are available "off-the-shelf." Both processes require the handling of large quantities of flammable, corrosive and toxic fluids at elevated pressures. Thus, in establishing the design and operating standards for plants and equipment using these processes, careful attention to materials selection and specifications is required to ensure long service life with high safety and reliability factors. The choice is primarily a function of economics and need. Most equipment, therefore, is prepared to customer requirements.

In both processes, equipment which individually is not especially designed or prepared for heavy water production can be assembled into especially designed or prepared systems for producing heavy water. Examples of such systems are the catalyst production system used in the ammonia-hydrogen exchange process and the water distillation systems used for the final concentration of heavy water to reactor-grade in either process.

C.2. Equipment especially designed or prepared for the production of heavy water utilizing either the water-hydrogen sulphide exchange process or the ammonia-hydrogen exchange process:

(i) Water-hydrogen Sulphide Exchange Towers

Exchange towers fabricated from carbon steel (such as ASTM A516) with diameters of 6 m (20 ft) to 9 m (30 ft), capable of operating at pressures greater

than or equal to 2 MPa (300 psi) and with a corrosion allowance of 6mm or greater.

(ii) Blowers and Compressors

Single stage, low head (i.e., 0.2 MPa or 30 psi) centrifugal blowers or compressors for hydrogen-sulphide gas circulation (i.e., gas containing more than 70 percent H₂S). The blowers or compressors have a throughput capacity greater than or equal to 56 m³/second (120,000 SCFM) while operating at pressures greater than or equal to 1.8 MPa (260 psi) suction and have seals designed for wet H₂S service.

(iii) Ammonia-Hydrogen Exchange Towers

Ammonia-hydrogen exchange towers greater than or equal to 35 m (114.3 ft) in height with diameters of 1.5 m (4.9 ft) to 2.5 m (8.2 ft) capable of operating at pressures greater than 15 MPa (2225 psi). The towers have at least one flanged, axial opening of the same diameter as the cylindrical part through which the tower internals can be inserted or withdrawn.

(iv) Tower Internals and Stage Pumps Used in the Ammonia-hydrogen Exchange Process.

Tower internals include especially designed stage contactors which promote intimate gas/liquid contact. Stage pumps include especially designed submersible pumps for circulation of liquid ammonia within a contacting stage internal to the stage towers.

(v) Ammonia Crackers Utilizing the Ammonia-hydrogen Exchange Process.

Ammonia crackers with operating pressures greater than or equal to 3 MPa (450 psi).

(vi) Infrared Absorption Analyzers

Infrared absorption analyzers capable of "on-line" hydrogen/deuterium ratio analysis where deuterium concentrations are equal to or greater than 90 percent.

(vii) Catalytic Burners Used in the Ammonia-hydrogen Exchange Process.

Catalytic burners for the conversion of enriched deuterium gas into heavy water.

Appendix L to Part 110 — Illustrative List of Byproduct Materials Under NRC Export/Import Licensing Authority

Actinium 225 (Ac 225)	Einsteinium 252 (Es 252)
Actinium 227 (Ac 227)	Einsteinium 253 (Es 253)
Actinium 228 (Ac 228)	Einsteinium 254 (Es 254)
Americium 241 (Am 241)	Einsteinium 255 (Es 255)
Americium 242m (Am 242m)	Erbium 169 (Er 169)
Americium 242 (Am 242)	Erbium 171 (Er 171)
Americium 243 (Am 243)	Europium 152 (Eu 152)
Antimony 124 (Sb 124)	Europium 152 9.2 h (Eu 152 9.2 h)
Antimony 125 (Sb 125)	Europium 152 13 yr (Eu 152 13 yr)
Antimony 126 (Sb 126)	Europium 154 (Eu 154)
Arsenic 73 (As 73)	Europium 155 (Eu 155)
Arsenic 74 (As 74)	Fermium 257 (Fm 257)
Arsenic 76 (As 76)	Fluorine 18 (F 18)
Arsenic 77 (As 77)	Gadolinium 148 (Gd 148)
Barium 131 (Ba 131)	Gadolinium 153 (Gd 153)
Barium 133 (Ba 133)	Gadolinium 159 (Gd 159)
Barium 140 (Ba 140)	Gallium 72 (Ga 72)
Bismuth 207 (Bi 207)	Germanium 68 (Ge 68)
Bismuth 210 (Bi 210)	Germanium 71 (Ge 71)
Bromine 82 (Br 82)	Gold 198 (Au 198)
Cadmium 109 (Cd 109)	Gold 199 (Au 199)
Cadmium 113 (Cd 113)	Hafnium 172 (Hf 172)
Cadmium 115m (Cd 115m)	Hassium 181 (Hs 181)
Cadmium 115 (Cd 115)	Holmium 166m (Ho 166m)
Calcium 48 (Ca 48)	Holmium 166 (Ho 166)
Calcium 47 (Ca 47)	Hydrogen 3 (H 3)
Californium 246 (Cf 246)	Indium 113m (In 113m)
Californium 249 (Cf 249)	Indium 114m (In 114m)
Californium 250 (Cf 250)	Indium 115m (In 115m)
Californium 251 (Cf 251)	Indium 115 (In 115)
Californium 252 (Cf 252)	Iodine 125 (I 125)
Carbon 14 (C 14)	Iodine 126 (I 126)
Cerium 141 (Ce 141)	Iodine 129 (I 129)
Cerium 143 (Ce 143)	Iodine 131 (I 131)
Cerium 144 (Ce 144)	Iodine 132 (I 132)
Cesium 131 (Cs 131)	Iodine 133 (I 133)
Cesium 134m (Cs 134m)	Iodine 134 (I 134)
Cesium 134 (Cs 134)	Iodine 135 (I 135)
Cesium 135 (Cs 135)	Iridium 192 (Ir 192)
Cesium 136 (Cs 136)	Iridium 194 (Ir 194)
Cesium 137 (Cs 137)	Iron 55 (Fe 55)
Chlorine 36 (Cl 36)	Iron 59 (Fe 59)
Chlorine 38 (Cl 38)	Krypton 85 (Kr 85)
Chromium 51 (Cr 51)	Krypton 87 (Kr 87)
Cobalt 58m (Co 58m)	Lanthanum 140 (La 140)
Cobalt 58 (Co 58)	Lead 210 (Pb 210)
Cobalt 60 (Co 60)	Lutetium 177 (Lu 177)
Copper 64 (Cu 64)	Manganese 52 (Mn 52)
Curium 240 (Cm 240)	Manganese 54 (Mn 54)
Curium 241 (Cm 241)	Manganese 56 (Mn 56)
Curium 242 (Cm 242)	Mendelevium 258 (Md 258)
Curium 243 (Cm 243)	Mercury 197m (Hg 197m)
Curium 244 (Cm 244)	Mercury 197 (Hg 197)
Curium 245 (Cm 245)	Mercury 203 (Hg 203)
Curium 247 (Cm 247)	Molybdenum 98 (Mo 98)
Dysprosium 165 (Dy 165)	Neodymium 147 (Nd 147)
Dysprosium 166 (Dy 166)	Neodymium 149 (Nd 149)

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Neptunium 237 (Np 237)	Praseodymium 142 (Pr 142)	Silver 106 (Ag 106)	Tellurium 132 (Te 132)
Nickel 59 (Ni 59)	Praseodymium 143 (Pr 143)	Silver 110m (Ag 110m)	Terbium 160 (Tb 160)
Nickel 63 (Ni 63)	Promethium 145 (Pm 145)	Silver 111 (Ag 111)	Thallium 200 (Tl 200)
Nickel 65 (Ni 65)	Promethium 147 (Pm 147)	Sodium 22 (Na 22)	Thallium 201 (Tl 201)
Niobium 93m (Nb 93m)	Promethium 149 (Pm 149)	Sodium 24 (Na 24)	Thallium 202 (Tl 202)
Niobium 94 (Nb 94)	Radium 223 (Ra 223)	Strontium 85 (Sr 85)	Thallium 204 (Tl 204)
Niobium 95 (Nb 95)	Rhenium 186 (Re 186)	Strontium 89 (Sr 89)	Thulium 170 (Tm 170)
Niobium 97 (Nb 97)	Rhenium 188 (Re 188)	Strontium 90 (Sr 90)	Thulium 171 (Tm 171)
Osmium 185 (Os 185)	Rhodium 103m (Rh 103m)	Strontium 91 (Sr 91)	Tin 113 (Sn 113)
Osmium 191m (Os 191m)	Rhodium 105 (Rh 105)	Strontium 92 (Sr 92)	Tin 123 (Sn 123)
Osmium 191 (Os 191)	Rubidium 86 (Rb 86)	Sulphur 35 (S 35)	Tin 125 (Sn 125)
Osmium 193 (Os 193)	Rubidium 87 (Rb 87)	Tantalum 182 (Ta 182)	Tin 126 (Sn 126)
Palladium 103 (Pd 103)	Ruthenium 97 (Ru 97)	Technetium 96 (Tc 96)	Titanium 44 (Ti 44)
Palladium 109 (Pd 109)	Ruthenium 103 (Ru 103)	Technetium 97m (Tc 97m)	Tritium (H3)
Phosphorus 32 (P 32)	Ruthenium 106 (Ru 106)	Technetium 99m (Tc 99m)	Tungsten 181 (W 181)
Phosphorus 33 (P 33)	Samarium 151 (Sm 151)	Technetium 99 (Tc 99)	Tungsten 185 (W 185)
Platinum 191 (Pt 191)	Samarium 153 (Sm 153)	Tellurium 125m (Te 125m)	Tungsten 187 (W 187)
Platinum 193m (Pt 193m)	Scandium 46 (Sc 46)	Tellurium 127m (Te 127m)	Vanadium 48 (V 48)
Platinum 193 (Pt 193)	Scandium 47 (Sc 47)	Tellurium 127 (Te 127)	Xenon 131m (Xe 131m)
Platinum 197m (Pt 197m)	Scandium 48 (Sc 48)	Tellurium 129m (Te 129m)	Xenon 133 (Xe 133)
Platinum 197 (Pt 197)	Selenium 75 (Se 75)	Tellurium 129 (Te 129)	Xenon 136 (Xe 136)
Polonium 208 (Po 208)	Silicon 31 (Si 31)	Tellurium 131m (Te 131m)	Ytterbium 173 (Yb 173)
Polonium 209 (Po 209)			Yttrium 90 (Y 90)
Polonium 210 (Po 210)			Yttrium 91 (Y 91)
Potassium 42 (K 42)			Yttrium 92 (Y 92)
			Yttrium 93 (Y 93)
			Zinc 65 (Zn 65)
			Zinc 66m (Zn 66m)
			Zinc 68 (Zn 68)
			Zirconium 93 (Zr 93)
			Zirconium 95 (Zr 95)
			Zirconium 97 (Zr 97)

Appendix M to Part 110 — Categorization of Nuclear Material^d

Material	Form	Category		
		I	II	III ^a
1. Plutonium ^a	Unirradiated ^b	2 kg or more.....	Less than 2 kg but more than 500 g.	500 g or less.
2. Uranium-235 ^c	Unirradiated ^b			
	Uranium enriched to 20 pct U ²³⁵ or more.....	5 kg or more.....	Less than 5 kg but more than 1 kg.	1 kg or less.
	Uranium enriched to 10 pct U ²³⁵ but less than 20 pct.		10 kg or more.....	Less than 10 kg.
	Uranium enriched above natural, but less than 10 pct U ²³⁵ .			10 kg or more.
3. Uranium-233.....	Unirradiated ^b	2 kg or more.....	Less than 2 kg but more than 500 g.	500 g or less.

^a All plutonium except that with isotopic concentration exceeding 80 pct in plutonium-238.

^b Material not irradiated in a reactor or material irradiated in a reactor but with a radiation level equal to or less than 100 rd/h at 1 m unshielded.

^c Natural uranium, depleted uranium, thorium and quantities of uranium enriched to less than 10% not falling into Category III should be protected in accordance with prudent management practice.

^d Irradiated fuel should be protected as category I, II, or III nuclear material depending on the category of the fresh fuel. However, fuel which by virtue of its original fissile material content is included as category I or II before irradiation should only be reduced one category level, while the radiation level from the fuel exceeds 100 rd/h at 1 m unshielded.

^e Physical security determinations will not be required for 15 g or less of plutonium, uranium-233 or high-enriched uranium, or for 1 kg or less of uranium with an enrichment between 10 and 20 pct in uranium-235.